1982 BAY AREA AIR QUALITY PLAN

San Francisco bay area

December 82

PREPARED BY:
ASSOCIATION OF BAY AREA GOVERNMENTS
BAY AREA AIR QUALITY MANAGEMENT DISTRICT
METROPOLITAN TRANSPORTATION COMMISSION
WITH THE ASSISTANCE OF:
CALIFORNIA AIR RESOURCES BOARD
CALIFORNIA DEPARTMENT OF TRANSPORTATION

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Prepared by

Association of Bay Area Governments
Bay Area Air Quality Management District
Metropolitan Transportation Commission

Hotel Claremont, Berkeley, California 94705

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SECTION I

SUMMARY OF THE PLAN

The purpose of this plan is to update and revise the 1979 Bay Area Air Quality Plan, which is part of the State Implementation Plan for California, and is also part of the San Francisco Bay Area Environmental Management Plan.

This plan describes the Bay Area's air quality problems and outlines the control programs needed to solve them. It addresses air quality standards set by the federal government to protect public health, and sets forth an approximate time schedule for adopting and implementing the control programs necessary to attain the federal air quality standards for ozone and carbon monoxide by the 1987 deadline specified by the Clean Air Act.

REVIEW OF THE 1979 BAY AREA AIR QUALITY PLAN

The 1979 Plan contained four major program elements:

- o Use of available control technology on existing stationary sources
- o New source review
- o Motor vehicle inspection and maintenance
- o Transportation system improvements

At that time, it was projected that implementation of these programs would result in attainment of the federal ozone and carbon monoxide standards by 1985. Three major factors have led to the need for 1982 Plan revisions:

- o Authorization for the motor vehicle inspection and maintenance program adopted in the 1979 Plan had not yet been provided by the California legislature.
- o The regulations adopted by the BAAQMD to implement new source review and the use of available control technology and new source review are less effective than assumed in the 1979 Plan.
- o Significant improvements have been made in the data base and models used to forecast future air quality.

PRESENT AND PROJECTED AIR QUALITY PROBLEMS

In the Bay Area, federal standards for ozone (O_3) and carbon monoxide (CO) are exceeded, and this plan is directed at these two pollutants. Federal standards for sulfur dioxide (SO2) and nitrogen

dioxide (NO2) are being met, and are not expected to be a problem in the future. The federal secondary standard for total suspended particulates (TSP) is exceeded on occasion, and was addressed in a separate plan revision submitted to the Environmental Protection Agency in 1980, and approved by EPA on March 29, 1982.

Ozone

The most complex air quality problem in the Bay Area is the ozone problem. The federal one-hour standard is 12 parts per hundred million (pphm), while the levels measured in the Bay Area (primarily in the Santa Clara Valley) reach 19 pphm. Ozone is not emitted directly into the atmosphere, but is produced in the atmosphere through a complex series of chemical reactions involving hydrocarbons (organic compounds) and oxides of nitrogen (NO_x). High ozone levels occur primarily during the summer and early fall; the number of days that the ozone standard is exceeded varies from year to year depending on meteorological conditions. In 1979 there were 15 exceedances recorded.

In the Bay Area the most efficient way to reduce ozone levels is to reduce hydrocarbon emissions. In 1979 there were 732 tons of hydrocarbons emitted per day in the Bay Area, not including emissions from natural vegetation. By 1987 emissions will be reduced to 515 tons per day due to the implementation of existing and previously adopted control programs as described in the 1979 Bay Area Air Quality Plan.

There is no single, major source of hydrocarbon emissions; instead, there are many sources of different types and magnitudes (e.g., cars, trucks, industries, petroleum-based solvents and other products, etc.) spread over the entire region. Moreover, the long history of air pollution control in the Bay Area means that the most effective and cost-effective control options have already been implemented. The remaining options will generally cost more and have less effect than those now being implemented. By 1987 the maximum hourly ozone level is projected to be 14.4 pphm, 2.4 pphm above the federal standard. To achieve this final increment of air quality improvement, hydrocarbon emission reductions of approximately 85 tons per day are required. (This value will vary slightly depending on the mix of sources and hydrocarbon species that are controlled.)

Carbon Monoxide

Carbon monoxide is a sub-regional air quality problem caused almost exclusively by motor vehicle exhausts. The major problem area is the Santa Clara Valley, centered on San Jose; other problem areas exist in Oakland and Vallejo. The federal one-hour CO standard of 40 mg/m3 (35 ppm) has not been exceeded in the Bay Area; the eight-hour standard of 10 mg/m3 (9 ppm) was exceeded on 21 days in 1979, with levels reaching 18 mg/m3. These exceedances occur in areas where two criteria are met: 1) high traffic density; and 2) adverse meteorological conditions produced on stagnant, winter evenings with surface-based radiation inversions. This combination of factors occurs most frequently and most intensively in the Santa Clara Valley.

Hot spot CO monitoring programs were conducted in San Jose and other locations in the Santa Clara Valley during the winters of 1978, 1979, and 1980. These studies have revealed the occurrence of high background CO levels on stagnant winter evenings. This means that the high CO levels measured are due more to areawide CO emissions than emissions from a specific highway or intersection. This phenomenon strongly suggests that street or intersection-specific traffic controls will be relatively ineffective in reducing ambient CO levels, and that control programs that are applied over wider areas will be most effective. By 1987, maximum 8-hour CO concentrations in downtown San Jose are projected to be reduced to 13.7 mg/m3 by existing control programs, 3.7 mg/m3 above the federal standard. Thus, a 27% reduction in CO emissions in the San Jose area will be necessary to meet that standard.

PROPOSED CONTROL PROGRAMS

The 1982 Bay Area Air Quality Plan recommendations are divided into two parts, addressing ozone and carbon monoxide separately. Each of these parts is further divided into primary and contingency components: the primary component contains those control measures that are recommended for implementation at this time; the contingency component contains those control measures that are recommended for later evaluation and implementation if it is demonstrated that reasonable further progress toward attainment of federal standards cannot be achieved with the primary measures. Other control measures that were considered in the process but judged to be not reasonably available are summarized in Appendix D.

The proposed control programs (not including contingency measures) and their impacts are summarized in Table 1. Brief descriptions of each measure follow.

Motor Vehicle Inspection and Maintenance

A motor vehicle inspection and maintenance (I/M) program is a vital link in the overall strategy for both ozone and carbon monoxide. The most recent version of I/M legislation, SB 33 (Presley), was finally passed by the legislature and signed into law on September 10, 1982. A biennial inspection program with a 25% vehicle emission reduction effectiveness is assumed for this measure.

Gasoline Conservation Awareness Program (GasCAP)

GasCAP is a comprehensive program to help reduce motor vehicle fuel consumption by vehicle fleets without impairing services. It establishes training programs within employer groups to teach proper trip planning, vehicle maintenance, and driving techniques to conserve fuel. During 1980, there was a demonstrated 10 to 46 percent reduction in fuel use by participating agencies; the concomitant modification of driving behavior is expected to produce changes in the driving cycle which result in a net reduction in vehicle emissions.

Stationary Source Control Measures

Twenty-three new regulations are proposed by the Bay Area Air Quality Management District for implementation. An additional eleven regulations are proposed for the contingency portion of the plan. These regulations all act to reduce hydrocarbon emissions, thereby reducing ozone levels in the region.

PROPOSED FOR IMPLEMENTATION

Tanker Ballasting: The Coast Guard has adopted a rule requiring segregated ballast or a washed ballast tank and an inert gas system for tankers larger than 40,000 DWT.

Reciprocating Engines (gasoline/gas fuel): New rule requiring reduction of hydrocarbon emissions from reciprocating engines. Replace two-cycle engines with four-cycle; replace four-cycle engines with electric motors where possible.

Gasoline Distribution: Modify Regulation 8 - Rule 6 and Rule 7 by lowering exemption cut-offs to require Phase I and Phase II controls at additional service stations.

Pesticides: New rule banning the use of weed oil, requiring the use of water or other non-VOC carriers and limiting overspray.

Wood Furniture Coating: New rule requiring 50% reduction of VOC through the use of low solvent coatings and high transfer efficiency spray methods.

Organic Chemical Manufacturing: New rule requiring control of volatile organic compound (VOC) fugitive emissions from pumps, compressors, process vessel depressurization and process relief valves. Limits would be similar to existing limits for petroleum refining plants.

Aerospace Assembly and Coating Operations: Regulation 8 - Rule 29 is being developed, with an independent workshop schedule.

Consumer Solvents: New rule limiting the organic content of consumer products. Rules to be developed on a product-by-product basis. Reformulate to lower reactivity/quantity of VOC diluents and propellants.

Coating of Plastics: New rule would require control of VOC emissions by the use of low-solvent coatings or equivalent control by condensation, adsorption, incineration, etc.

Semiconductor & Printed Circuit Board Manufacturing Operations: New rule would require control of significant solvent emitting sources by condensation, adsorption, etc.

Industrial Maintenance Coatings: New rule requiring the use of low solvent coatings for some industrial maintenance applications.

VOC Storage: Modify Regulation 8 - Rule 5 by lowering control requirement cut-offs from 1.5 psia and 40,000 gallons to 0.5 psia and/or 10,000 gallons.

Large Commercial Bakeries: New rule requiring control of oven VOC emissions from large commercial bakeries.

Zero Gap Seals for Floating Roof Tanks: Modify Regulation 8 - Rule 5 to require installation of "zero gap" seals on most floating roof tanks.

Polymer and Resins Manufacturing: New rule requiring control of VOC emissions from reactor vessels, etc., by condensation, adsorption.

Rubber/Plastic Products Manufacturing: New rule requiring control of VOC emissions from molding, curing, cementing, etc., by condensation, adsorption or incineration.

Coatings Manufacturing: New rule requiring control of VOC emissions from reactors, blenders, mixers, and transfer and storage. Requirements would be similar to existing requirements for pharmaceutical products in Regulation 8 - Rule 24.

Natural Gas and Crude Oil Production: New rule requiring control of VOC fugitive emissions from valves, flanges, pumps, compressors, relief valves, and storage tanks. Limits would be similar to existing limits for petroleum refining plants.

Sanitary Landfill Sites: New rule requiring the installation of gas collection systems. Gas would be combusted directly or separated into a saleable methane portion and a non-methane portion, to be incinerated.

Vegetable Oil Manufacturing: New rule requiring control of VOC emissions from extractors, desolventizers, dryers, coolers and conveyors by a mineral oil scrubber and proper maintenance and operation per draft EPA CTG.

Volatile Organic Waste Disposal: New rule requiring stripping and recovery of VOC from wastes prior to disposal.

Automobile Refinishing: New rule requiring 50% reduction of VOC emissions by lowering VOC content of automobile refinishing coatings.

Letterpress/Offset Printing: Modify Regulation 8 - Rule 20 by deleting letterpress/offset exemption and adding specific VOC emission limits.

PROPOSED FOR CONTINGENCY

Architectural Coatings: Modify Regulation 8 - Rule 3 by lowering the VOC content limit for flat coatings from 250 to 125 grams per liter.

Ship, Barge, Tanker and Railcar Loading: New rule(s) requiring 90 to 95% control of VOC emissions by vapor balance, condensation, etc.

General Solvent and Surface Coating Operations: Modify Regulation 8 - Rule 4 by lowering hourly and daily VOC emission limits.

Pleasure Boats (gasoline and diesel fuel): New rule requiring hydrocarbon controls on new engines.

New Source Review: Modify Regulation 2 - Rule to increase the onsite offset ratio for VOC from 1.0:1 to 1.1:1 or 1.2:1 on an annual average basis.

New Service Stations: Modify Regulation 8 - Rule 7 to require the use of vacuum assist vapor recovery systems for vehicle fueling at new service stations.

Lawnmowers: New rule banning the sale of two-cycle lawnmowers and limiting hydrocarbon emissions from new four-cycle engines.

Off-Road Motorcycles (gasoline two-cycle): New rule banning the sale of new two-cycle engines in favor of four-cycle.

Wineries: New rule requiring control of VOC emissions during fermentation by condensation, absorbtion, etc.

Marine Vessel Gas-Freeing: New rule would require gas freeing be conducted outside District waters with exceptions for safety considerations, etc.

Marine Lightering: New rule to reduce organic emissions from lightering through use of deep draft vessels, minimum ullage requirements, etc.

Transportation Control Measures

Ten transportation measures are proposed for implementation. These measures act to reduce both hydrocarbon and carbon monoxide emissions regionwide.

PROPOSED FOR IMPLEMENTATION

1. Reaffirm commitment to 28% transit ridership increase between 1978 through 1983.

2. Support post-1983 improvements identified in transit operators' 5-year plans; after consultation with the operators adopt ridership increase target for 1983-1987.

3. Seek to expand and improve public transit beyond committed levels.

4. Continue to support development of HOV lanes. (Emission reduction credit would not be allowed for specific projects until environmental studies were completed and funds were programmed.)

5. Continue to support RIDES efforts.

6. Continue efforts to obtain funding to support long-range transit improvements.

7. Reaffirm commitment to preferential parking programs.

8. Encourage transit operators to work with Caltrans to identify under-utilized lots along major transit lines which could be used as park-and-ride lots.

9. Expand the Commute Alternatives Program.

10. Develop information program on traffic and air quality mitigation measures for local governments.

In addition to these programs the Commute Transportation Program being developed and implemented by the Santa Clara County Transit District is a crucial program for attainment of the CO standard in San Jose.

PROPOSED FOR CONTINGENCY

No contingency transportation messures have been identified for ozone. Selection of such measures will take place within six months of a determination that reasonable further progress toward attainment of the ozone standard is not being made. For carbon monoxide, the recommendations of the Santa Clara Valley Corridor Evaluation, including a light rail transit system for the Guadalupe Corridor, are included as contingency. (This measure is being pursued independently, but is included as contingency because funding is not certain at this time.) Also included as contingency are two programs being pursued by the City of San Jose: 1) development of parking management policies for the downtown area; and 2) improvements in downtown traffic circulation, including signal interconnects.

In addition to the programs mentioned above, a comprehensive transportation and air quality study of projected Oakland central business district development is proposed. This study is recommended because of the large number of sizeable projects recently proposed for that area where excesses of the CO standard are known to occur.

No additional control programs are recommended for Vallejo since it is projected to attain the CO standard by 1987 with existing control programs.

Administrative Programs for Long-Term Maintenance

Two administrative programs that would enhance the ability of the region to maintain improved air quality over the long term are recommended for the plan. Those measures are:

Advisory Review of Projects and Plans: This program is directed toward new or modified facilities, both public and private, and plans that could result in significant impacts on air quality. Such facilities would include major shopping centers, office developments, large housing developments, highways, airports, parking structures and entertainment complexes. While they are not direct air pollution sources themselves, they do attract large volumes of vehicle traffic which can lead to air quality problems. Such review systems are currently in effect on a mandatory basis at Lake Tahoe and other areas in the nation. The Advisory Review system proposed here would be, as the name implies, advisory in nature. It would be conducted administratively as part of Plan and Project Review functions and would use the existing California Environmental Quality Act environmental document process as the primary vehicle for receiving information and communicating comments. The three co-lead air quality planning agencies (ABAG, MTC, BAAQMD) would participate and issue coordinated comments on specific projects, and would work with cities, counties and project sponsors to minimize adverse air quality impacts.

Conformity Assessment of Federally-Supported Activities: This program would implement the requirements of Sections 176(c) and 316 of the Clean Air Act, which require that federally-supported activities be in conformance with the State Implementation Plan for an area.

The proposed program would be conducted as part of ABAG's Plan and Project Review function. As the areawide clearinghouse for all federal grant applications (under requirements of the Federal Intergovernmental Cooperation Act and the Federal Demonstration Cities and Metropolitan Development Act), ABAG's Executive Board comments on federal grant applications for conformity with adopted regional policies, including provisions of the air and water quality management plan. Hence, conformity assessment under the two Clean Air Act sections cited above can be easily conducted using ABAG's existing Plan and Project Review function.

LAND USE MEASURES

Land use measures, along with transportation control measures, are needed to curb auto emissions as the region grows, and assure maintenance of adequate air quality to the year 2000 and beyond. However, this plan does not advocate that regional policy bodies should require land use control measures. Cities and counties should consider modifying their general plans to: contain development in urban service areas with urban services in place; encourage mixed-use development and infill on vacant land at densities sufficient to support transit; and encourage rehabilitation and reuse of older buildings.

BENEFITS AND COSTS OF THE PLAN

Reducing ambient ozone and carbon monoxide will result in benefits in three major areas:

- o improvements in public health
- o reduction in damage to vegetation
- o reduction in damage to other materials

Ozone causes a wide variety of health problems including: irritation of the eyes and mucous membranes, impaired lung function and changes in the cellular composition of the lungs, increased susceptibility to infectious disease, biochemical imbalances in the lungs and other organs, rapid pulse, cough, chest discomfort, and a general decrease in human performance. Exposure to ozone also aggravates conditions such as asthma, chronic bronchitis and emphysema.

Ozone also has negative effects on a variety of plants and man-made materials. The economic losses nationwide due to vegetation damage from ozone and other photochemical oxidants was estimated in 1978 to be $300 million per year. Ozone has been shown to cause more rapid deterioration of rubber products, fading in textiles, paints and dyes, and more rapid deterioration of fibers in many textile products.

The primary effect of carbon monoxide is to displace oxygen in the blood which, in turn, decreases the supply of oxygen to various parts of the body, particularly the cardiovascular and central nervous systems. Exposures to levels as low as 15 ppm have produced cardiovascular and nervous system effects such as decreased alertness, muscular incoordination, decreased learning ability and visual perception, changes in sleep patterns and decreased manual dexterity. In addition, large segments of the population are at increased risk from CO exposure; such high risk groups include fetuses, person with cardiovascular or nervous system conditions, sickle cell anemics, the young and the elderly.

The costs of these effects lie primarily in terms of human suffering, inconvenience, incapacitation and ecological damage. The benefits of controlling ozone and carbon monoxide lie in the reduction or elimination of such effects. The annual costs of implementing the proposed control programs are indicated in Table 1 and total approximately $100 million. This amounts to an annual cost of about $20 per person or $50 per household, on the average, in the Bay Area.

IMPLEMENTATION SCHEDULE

The proposed control programs are targeted for phased implementation between 1983 and 1987, beginning with the most effective programs. Rough dates are indicated in Table 1 in each case. Figure 1 illustrates the overall year-by-year progress that is expected for hydrocarbon emission reductions with both existing and proposed control programs.

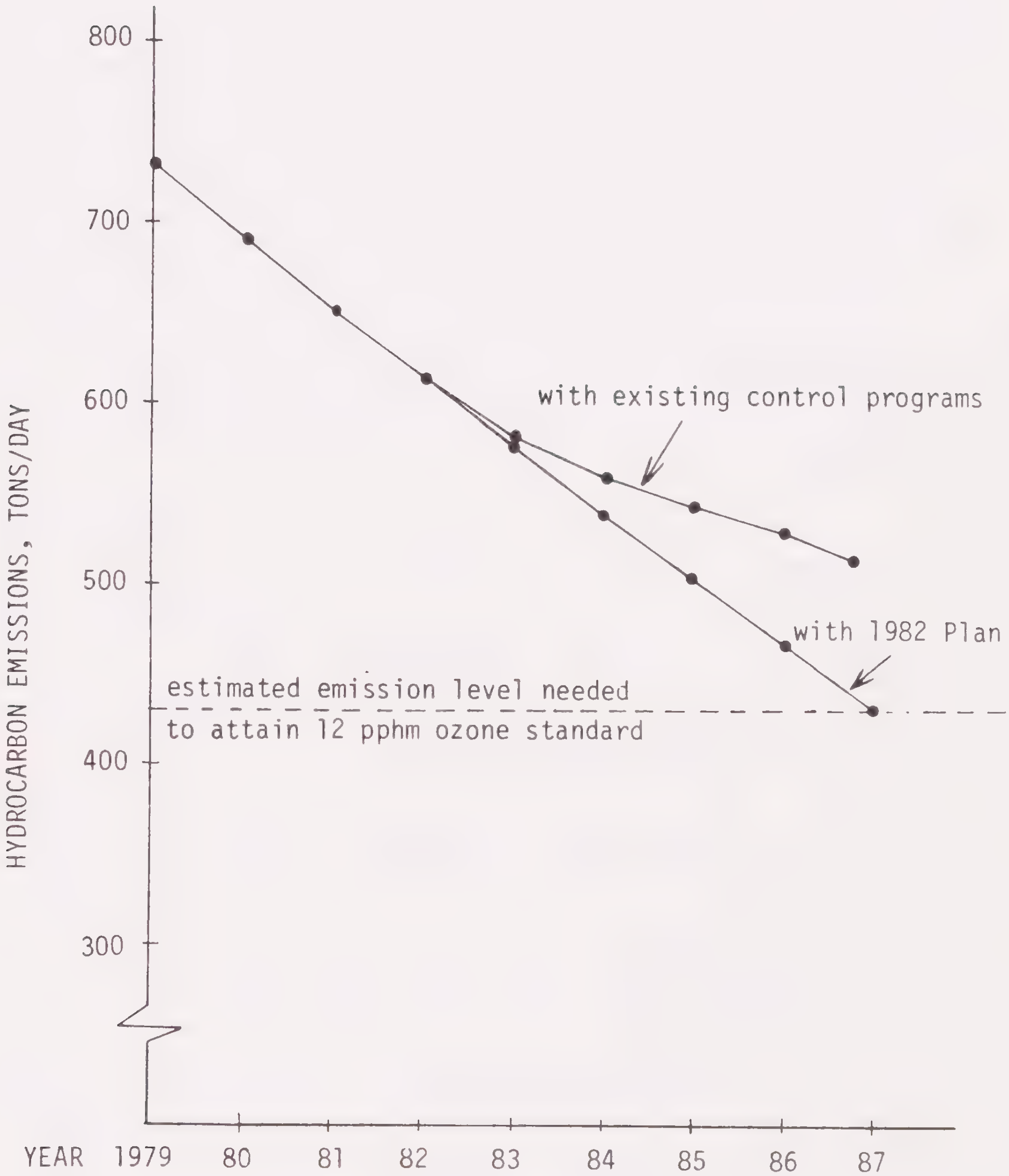


Figure 1. Schedule of Hydrocarbon Emission Reduction Proposed to Achieve the Federal Ozone Standard in the San Francisco Bay Area

ANNUAL AIR QUALITY REPORTS

Annual air quality reports are prepared in response to Sections 171, 172, and 173 of the 1977 Clean Air Act Amendments, and in response to annual report requirements issued by the U.S. Environmental Protection Agency and the California Air Resources Board. Their purpose is to provide the public and regulatory agencies with a progress report on the effectiveness of air pollution control programs in reducing both emissions and ambient levels of air pollutants in the Bay Area.

The goal of the 1982 Bay Area Air Quality Plan is to achieve ambient air quality standards in the Bay Area by 1987 by controlling pollutant emissions. Assessing the effectiveness of control programs on an annual basis will identify successes or failures of the programs in meeting the goal of the 1982 Plan. If emissions are not decreasing at rates that will allow standard attainment by 1987, then further controls must be adopted and implemented.

Thus, the annual reports will serve as the principal vehicle for determining needs, evaluating options, and amending the plan. Future annual reports will include the following items:

- Updated emission inventories and emission inventory projections;
- Updated assessments of ambient air quality in the proceeding year and developing trends;
- Updated assessments of demographic and economic trends which affect air quality in the Bay Area;
- Results from a regional travel monitoring system designed to track trends in vehicular travel in the Bay Area;
- Review of progress in implementing the control programs adopted in the 1979 and 1982 Bay Area Air Quality Plans;
- Review of changes in the specification of reasonably available control technology (RACT) and best available control technology (BACT) for various source categories;
- Updates on the Air Resources Board's suggested control measure (SCM) process, and the applicability of such SCMs to the Bay Area;
- Review of new state and federal regulations pertaining to the Plan or to sources affected by the Plan, as needed;
- Assessment of whether "reasonable further progress" toward attainment of federal air quality standards was achieved during the previous year.

Uncertainties in the data and evaluating methodologies make monitoring for reasonable further progress an important element of the carbon monoxide control strategy. For instance, actual I/M program effectiveness will be a function of the selected emissions testing methods, stringency factor and quality control methods. As the program is implemented in the Bay Area, lower (or higher) emission reductions may be found than currently estimated for the Plan.

The Santa Clara County Transit District has established an ambitious target for their Commute Transportation Program. The targeted reduction in single-occupancy auto commuting constitutes an important element in the strategy to reduce emissions on an areawide basis. If the reductions are not fully realized, alternative measures will be needed. Therefore, a program for evaluating reasonable further progress will be developed that includes the following:

- An annual program of traffic counts at key intersections in downtown San Jose.
- A procedure to assess the effectiveness and progress of the Commute Transportation Program.
- The tracking of the effectiveness of motor vehicle inspection and maintenance in reducing vehicular emission rates.
- The tracking of vehicle turn-over and deterioration rates.
- The tracking of ambient carbon monoxide levels in San Jose.
- Implementation of Advisory Review and Conformity Assessment Programs.

Future funding for this activity is uncertain, and the depth of coverage of each of these items will vary depending on the resources that can be made available for this purpose.

1984 PLAN UPDATE

In addition to the preparation of annual reports, both the Bay Area Air Quality Management District and the Association of Bay Area Governments have committed to preparing an update of the Plan by October 1984. By that time it is expected that more specific information will be available on the effectiveness of each of the adopted control programs as well as on the impact of the control program on ozone levels in neighboring air basins.

TABLE 1. SUMMARY OF PROPOSED CONTROL MEASURES AND THEIR IMPACTS

RECOMMENDATIONS	DIRECT BENEFITS (EMISSION REDUCTIONS, TONS/DAY) 1987	IMPLEMENTING AGENCY(S)	SCHEDULE FOR ACTION A-ADOPTION I-FULLY IMPLEMENTED	TOTAL COST/YEAR OF RECOMMENDED ACTION	FINANCING MECHANISM	LEGAL AUTHORITY
I. MOTOR VEHICLE INSPECTION AND MAINTENANCE						
Implement annual inspection/maintenance program to ensure that motor vehicles in the light-duty auto, light- and medium-duty truck classes have operating emissions controls and that they conform to prescribed emissions standards.	Carbon monoxide: 367 Hydrocarbons: 29	California Department of Consumer Affairs	A-1984 I-1987	$31,500,000	-State General Fund -I/M Program Revenues	New legislation required.

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
Air Quality o See "Direct Benefits" column. Water Quality o No impact. Physical Resources o Reducing emissions of air pollutants will have a beneficial impact on vegetation and other man-made materials which are currently being damaged by such pollutants. These beneficial effects will result from this strategy as well as the others being proposed in this plan. Energy Resources o No impact.	Institutional o Specific institutional arrangements will have to be developed, since I/M is not within the current authority of any State or local agency. The California Department of Consumer Affairs would likely assume responsibility for the regulation and operation of these programs. Local government agencies' involvement is not anticipated. o I/M programs can be directly administered by the State or franchised out to private contractors; due to the disproportionate demands on State administrative resources demonstrated by the South Coast Air Basin, a private-operated/public-monitored program may be preferable for the Bay Area. Financial Direct Public Cost of Implementation o See column headed "Total Cost/Year of Recommended Action". Fiscal Effect on Local Government o No impact.	Production of Goods and Services o Implementation of I/M measures would add a new line of service for the California automotive service industry. Some services presently exist for identifying defective emission control equipment, but they are not universally applicable to all California registered vehicles. I/M programs for light-, medium-, and heavy-duty vehicles would offer a universally applied service program for identification and repair of vehicles with excessive emissions caused by maladjusted or defective emission control equipment. Consumer Expenditures o I/M consumer costs are comprised of the inspection fee and related maintenance and repair costs which may be incurred. The inspection fee will probably not exceed $15, and the average cost of repairs for the failed vehicle is approximately $30. Income and Investment o See private costs in the column headed "Total Costs/Year of Recommended Action." o Improved maintenance may prolong vehicle life.	Housing Supply o No impact. Physical Mobility o Because of the increased cost of private transportation, the mobility of the limited income segment of the Bay Area population may be reduced, particularly for those in other than urban areas. Health and Safety o The substantial reduction in emissions of carbon monoxide and hydrocarbons from this measure could produce substantial health-related benefits, particularly for high risk groups and those who experience the heaviest exposures while residing, working or shopping in urban centers. Sense of Community o No impact. Equity o Older vehicles generally need more extensive repairs; this may place a special financial burden on lower-income persons who are more likely to own older vehicles.

RECOMMENDATIONS	DIRECT BENEFITS (EMISSION REDUCTIONS, TONS/DAY) 1987	IMPLEMENTING AGENCY(S)	SCHEDULE FOR ACTION A-ADOPTION I-FULLY IMPLEMENTED	TOTAL COST/YEAR OF RECOMMENDED ACTION	FINANCING MECHANISM	LEGAL AUTHORITY
II. STATIONARY SOURCE CONTROLS						
1. Tanker Ballasting: Use segregated ballast or washed ballast tank and inert gas system for tankers larger than 40,000 DWT	2.5	U.S. Coast Guard	A, I-1981	No direct costs	Administrative/ Regulatory -ad valorem tax revenues -ARB subvention funds -Federal Clean Air Act funds -permit fees Operating/ Maintenance -private Capital -private -California Pollution Control financing authority -Federal Small Business Administration loan programs	The Bay Area Air Quality Management District (BAAQMD) was created by the California Legislature in 1955. The District structure, operating procedures and authority are contained in Division 26 of the California Health and Safety Code.
2. Reciprocating Engines: Replace 2-cycle engines with 4-cycle; replace 4-cycle engines with electric motors where possible	4.0	Bay Area Air Quality Management District (BAAQMD)	A-1984 I-1985	$290,000		
3. Gasoline Distribution: Lower exemption cutoffs to require Phase I, II controls at additional service stations	1.0	BAAQMD	A-1985 I-1985	$180,000		
4. Pesticides: Ban weed oil; use water or other non-VOC carriers; limit overspray	3.7	BAAQMD	A-1984 I-1984	$530,000		
5. Wood Furniture Coating: Use low solvent coatings and high transfer efficiency spray methods	1.1	BAAQMD	A-1985 I-1986	$200,000		
6. Organic Chemical Manufacturing: Requires control of VOC fugitive emissions from pumps, compressors, process vessel depressurization and process relief valves	0.3	BAAQMD	A-1986 I-1986	$58,000		
7. Aerospace Assembly & Component Coating Operations: reformulate paints by converting to waterbased or high-solids paints or substituting non-reactive solvents for reactive ones in conventional paints	0.5	BAAQMD	A-1982 I-1983	$180,000		
8. Consumer Solvents: Reduce VOC content/ reactivity after product-by-product review.	4.0	BAAQMD	A-1985 I-1985	$600,000		
9. Coating of Plastics: Use low-solvent coatings or equivalent control by condensation, adsorption, incineration, etc.	2.0	BAAQMD	A-1985 I-1985	$730,000		
10. Semiconductor/PC Manufacturing: Use condensation, adsorption, etc. to control solvent emissions.	5.7	BAAQMD	A-1983 I-1984	$7,900,000		
11. Industrial Maintenance Coatings: Use low-solvent coatings for some industrial maintenance applications	1.0	BAAQMD	A-1985 I-1986	$370,000		

ENVIRONMENTAL IMPACTS

Air Quality

- o See "Direct Benefits" column.

Water Quality

- o No impacts.

Physical Resources

- o Conservation of 10,000 to 12,000 gals/day of volatile organic compounds. (Approx. $4 million per year.)
- o Some rules (best available control technology) would consume construction materials, water, disposal facilities, etc.

Energy Resources

- o Use of BACT (5 or 6 measures) and, in some cases, lowest attainable emission rate (1 or 2) may result in a net energy penalty.

Public Facilities

- o No serious impact other than landfill sites which may use land owned by either public or private parties.

INSTITUTIONAL/FINANCIAL IMPACTS

Institutional

- o The governmental structure for implementing these control measures already exists in the Bay Area Air Quality Management District (BAAQMD) which actively enforces air pollution control programs in the Bay Area. The proposed amendments are an expansion of existing organic emission rules to cover new categories of sources, or are more stringent extensions of measures already in force for control of industrial and stationary sources of air pollution.

Financial

Direct Public Costs of Implementation

- o See "1982 Costs of Recommended Control Actions" column; annualized costs of $24 million to $62 million per year.

Fiscal Effects on Local Government

- o Increased costs to BAAQMD may be 6% of District's budget, or $600,000/year. Other local governmental costs are minimal except for landfill sites, which are not clear at this time. The governmental structure for the implementation of these control measures already exists in the Bay Area Air Quality Management District, as mentioned above.

ECONOMIC IMPACTS

Production of Foods and Services

- o Increased technological dependence by the Bay Area industrial sector to improve regional air quality will require substantial capital investment. In some instances, these added restrictions and costs will adversely affect the competitive position of local industries interregionally where the cost of these investments may be passed on to the consumers.
- o Measures pertaining to coatings, waste disposal and consumer solvents will require that process changes occur in order to reduce levels of air pollution. Changed product composition resulting from different processes may cause reduced durability and increased liability potentials. Phased implementation of this program may help minimize these problems.
- o Special consideration may be needed for the food processing industry in meeting health standards.

Consumer Expenditures

- o Direct costs of implementing these measures will initially fall upon industry but eventually be paid by the consumer and local taxpayer. This type of expenditure will not increase productivity but cause inflationary activity. Also, higher prices for Bay Area products may cause non-Bay Area consumers to look elsewhere for the same product. In either case, the proposed controls will result in increased cost of consumer goods.

Income and Investments

- o See column "1982 Costs of Recommended Control Action."

SOCIAL IMPACTS

Housing Supply

- o No impacts.

Physical Mobility

- o No impact.

Health and Safety

- o Air quality standards for each of the pollutants are based upon scientifically derived air quality criteria. Air quality criteria are an expression of current information concerning the relationship between various concentrations of pollutants in the air and their adverse effects on man and his environment. The control measures being proposed are designed to meet the standards, i.e., to reduce the concentration of various pollutants in the air. Pollutant concentration reductions from the air will reduce potentially adverse effects from these substances, thereby favorably impacting public health.
- o With regard to safety, the stationary source control program may eliminate many hazards associated with the use and storage of combustible solvents.

Sense of Community

- o No impact.

Equity

- o A major question of equity involves the competitive position of Bay Area industries that are placed under the restrictions and controls proposed. Employment opportunities created in local industries producing air pollution control equipment will not offset increased unemployment resulting from the competitive disadvantage (see "Production of Goods and Services"). The willingness of EPA and CARB to require similar measures outside of the Bay Area is of obvious concern to the region.

RECOMMENDATIONS II. STATIONARY SOURCE CONTROLS (Cont'd.)	DIRECT BENEFITS (EMISSION REDUCTIONS, TONS/DAY) 1987	IMPLEMENTING AGENCY(S)	SCHEDULE FOR ACTION A-ADOPTION I-FULLY IMPLEMENTED	TOTAL COST/YEAR OF RECOMMENDED ACTION	FINANCING MECHANISM	LEGAL AUTHORITY
12. VOC Storage: Lower control requirement cut-offs from 1.5 psia and 40,000 gallons to 0.5 psia and/or 10,000 gallons	3.0	BAAQMD	A-1985 I-1985	$990,000		
13. Large Commercial Bakeries: Control oven VOC emissions from large commercial bakeries	1.1	BAAQMD	A-1986 I-1986	$400,000		
14. Zero Gap Seals on Floating Roof Tanks: Install "zero gap" seals on most floating roof tanks	1.5	BAAQMD	A-1985 I-1986	$22,000		
15. Polymer & Resins Manufacturing: Use condensation, adsorption to control VOC emissions from reactor vessels, etc.	0.2	BAAQMD	A-1986 I-1987	$120,000		
16. Rubber / Plastic Products Manufacturing: Use condensation, adsorption or incineration to control VOC emissions from molding, curling, cementing, etc.	1.1	BAAQMD	A- 1986 I-1986	$640,000		
17. Coatings Manufacturing: Requires control of VOC emissions from reactors, blenders, mixers, and transfer and storage	0.2	BAAQMD	A-1986 I-1987	$150,000		
18. Natural Gas & Crude Oil Production: Requires control of VOC emissions from valves, flanges, pumps, compressors, relief valves and storage tanks	1.6	BAAQMD	A-1986 I-1986	$440,000		
19. Sanitary Landfill Sites: Install gas collection systems to be combusted directly or separated into a saleable methane portion and non-methane portion to be incinerated	7.2	BAAQMD	A,I-1984	$9,500,000		
20. Vegetable Oil Manufacturing: Use mineral oil scrubber and proper maintenance/operation per draft EPA CTG for extractors, desolventizers, dryers, coolers and conveyers	0.4	BAAQMD	A-1986 I-1987	$150,000		
21. Volatile Organic Waste Disposal: Strip and recover VOC from wastes prior to disposal	6.0	BAAQMD	A-1984 I-1985	$5,200,000		
22. Automobile Refinishing:	5.2	BAAQMD	A-1984 I-1985	$5,400,000		
23. Letterpress/Offset Printing:	3.0	BAAQMD	A-1985 I-1985	$2,000,000		

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS

See preceding page.

RECOMMENDATIONS	DIRECT BENEFITS (EMISSION REDUCTIONS, TONS/DAY) 1987	IMPLEMENTING AGENCY(S)	SCHEDULE FOR ACTION A-ADOPTION I-FULLY IMPLEMENTED	TOTAL COST/YEAR OF RECOMMENDED ACTION	FINANCING MECHANISM	LEGAL AUTHORITY
III. TRANSPORTATION CONTROLS						
1. Reaffirm commitment to 28% transit ridership increase between 1978 and 1983.	Included in 1979 Air Quality Plan - no additional credits are claimed.	Metropolitan Transportation Commission (MTC), transit districts.	Measure is currently being implemented, with a 26% increase in ridership resulting in the first 3-year period.	Included in Transportation Improvement Program - no additional costs.	-Federal Mass Transportation Assistance Program -Fare Revenues -Local Transportation Development Act Funds -State Mass Transportation Assistance Programs -Toll Bridge Revenues	-Local Transit District Enabling Legislation -MTC Enabling Legislation
2. Support post-1983 improvements identified in public transit operators' 5-year plans; after consultation with the operators, adopt ridership increase target for 1983-1987.	Hydrocarbons: 0.72 Carbon Monoxide: 7.15 Nitrogen Oxides: 1.04		A-1982 I-continuing	Costs of maintaining existing level of services is currently programmed in regional allocations. Ridership increases would come from productivity improvements, thus additional costs would be moderate.		
3. Seek to expand and improve public transit beyond committed levels.	Hydrocarbons: 0.37 Carbon Monoxide: 3.69 Nitrogen Oxides: 0.54		MTC seeks new sources of revenue on an ongoing basis; if funding exists, transit operators implement plans to expand services.	Transit operators have submitted capital requests for FY83-87; of these, $119.4 million cannot be funded with currently anticipated revenues. Additional funds would also be needed for operating subsidies. However, this measure has other benefits so the costs cannot be solely attributed to air quality.		
4. Continue to support development of high-occupancy-vehicle (HOV) lanes.	Depends on specific project. Emission credits would not be allowed for specific projects until environmental studies were completed and funds were programmed.	Caltrans, cities and counties	A-1979 I-varies with the project	Varies by specific project; since these projects have other benefits, the costs cannot be solely attributed to air quality.	-Federal Aid Highway Programs -State Highway Program Funds	-Caltrans enabling legislation -Local planning and traffic control enabling legislation
5. Continue to support RIDES efforts; carpool matching and vanpooling.	Emissions credits already included in 1979 Plan - no additional credit is claimed.	RIDES, MTC, Caltrans	A-1979 I-continuing	Funds are already programmed; no additional costs are associated with this measure.	-Federal Aid Highway Programs -State ridesharing funds	-Caltrans enabling legislation -RIDES charter -MTC enabling legislation
6. Continue efforts to obtain funding to support long range transit improvements (including a light rail line in the Guadalupe Corridor and various BART extensions).	It is likely that none of the projects included in this measure can be implemented prior to 1987, hence no emissions credits are claimed.	MTC, transit districts	A-1979 I-continuing	Project design costs over the next 5 years total $35 million; construction costs of the Guadalupe project over the next 5 years is $181 million.[1]	Same as #1.	Same as #1.
7. Reaffirm commitment to preferential parking program: opening more fringe parking lots and free vanpool parking areas.	Emissions credits already included in 1979 Plan - no additional credit is claimed.	Caltrans	A-1979 I-continuing	Costs already included in the Transportation Improvement Program; no additional costs are associated with this measure.	Same as #5.	-Caltrans enabling legislation

1. Due to the range of benefits from these measures the costs cannot be attributed solely to air quality.

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
Air Quality o See "Direct Benefits" column. Water Quality o No impact. Physical Resources o No impact other than the reduction in damage to vegetation and man-made materials associated with lower pollutant emissions. Energy o Gasoline savings estimated to be 18-19 million gallons/year from carpooling, the shift to transit, improved traffic flow, and the shift to bicycles.. o Minor increase in transit fuel consumption. Amenities o Cleaner air. o Improved pedestrian environment in auto-control zone.	Institutional o Organizational and governmental structures necessary to implement these measures are already in existence and, as these are continuations of previously adopted measures, progress in their implementation is already ongoing. Financial o Certain measures, notably the additional transit services, bus/carpool lanes, and bicycle systems, are rather costly. There is some funding available, but additional funds will be needed. o Other measures would generate revenue which could be used to finance the incentives mentioned above.	Production of Goods and Services o New employment in the transit sector. o Possible adverse effect on parking lot operators. Consumer Expenditures o Increase in cost of operating private autos. o Savings to those commuters utilizing carpools, vanpools or transit.	Housing Supply o No impact. Physical Mobility o Additional transit service would increase mobility of all transit users. o Carpool/vanpool measures would increase travel options for most commuters. o Some restriction on private auto access in the auto control zone. Health and Safety o Reduction in auto accidents with improved peak period flow. o Exercise benefits for those who bicycle. o Possible increase in number, but not rate, of bicycle accidents with increased usage. Sense of Community o No impact. Urban Patterns o The combination of incentives like additional transit service and disincentives on private auto use will encourage a more compact land use pattern, with employees living closer to transit lines and/or their jobs. o Pricing disincentives will impact primarily middle income commuters who choose to continue driving their cars.

RECOMMENDATIONS	DIRECT BENEFITS (EMISSION REDUCTIONS, TONS/DAY) 1987	IMPLEMENTING AGENCY(S)	SCHEDULE FOR ACTION A-ADOPTION I-FULLY IMPLEMENTED	TOTAL COST/YEAR OF RECOMMENDED ACTION	FINANCING MECHANISM	LEGAL AUTHORITY
III. TRANSPORTATION CONTROLS (Cont'd.)						
8. Encourage transit operators to work with Caltrans to identify underutilized lots along major transit lines which could be used as park-and-ride lots.	Hydrocarbons - 0.4 Carbon Monoxide - 0.19 Nitrogen Oxides - 0.05	Caltrans, transit districts	A-1979 I-continuing	Equivalent annual cost of this measure is $22,850.[1]	-State Highway Program funds	Same as #7.
9. Expand present Commute Alternatives Program: informing employers of transportation alternatives and training commute coordinators within a firm to promote the goals of the program.	Hydrocarbons - 0.87 Carbon Monoxide - 0.83 Nitrogen Oxides - 0.89	MTC	A-1979 I-continuing train 30 commute coordinators each year	Equivalent annual cost is $35,420.	-Federal Mass Transit Assistance Programs -Local Transportation Development Act funds -State Ridesharing funds	-MTC enabling legislation
10. Develop information program on traffic and air quality mitigation measures for local government.	Hydrocarbons - 0.69 Carbon Monoxide - 6.04 Nitrogen Oxides - 0.27	MTC, cities and counties	A-1979 I-continuing	Equivalent annual cost is $13,700[1]	-Local Transportation Development Act funds -City General Funds	-Municipal zoning enabling legislation
11 Support the expansion of the Gasoline Conservation Awareness (GasCAP) Program currently operating through West Valley Community College--several additional regional GasCAP training centers are needed for the Bay Area.	Depends upon the number of centers funded, the number of client agencies per center and the fuel use of each client agency--reductions in fuel use of 10 46% have been demonstrated by previous client agencies.	Regional operation concept as follows: -State Energy Commission and CA Energy Extension Service - provide overall coordination of statewide plan, of which the Bay Area is a part. -CalTrans - sponsoring agency which receives federal monies and transfers them to statewide coordinating agencies. -GasCAP-(West Valley Com. College) provids assistance and training to regional center agencies offering program. -Regional Center Agency - provides regional GasCAP service.	A-1982 I-additional training centers can be operational within 1 year of funding.		-Grant funds are being sought for additional regional centers -Participant fees provide ongoing support.	-None required.
12 Commute Transportation Program	Reduces background CO level 14% from 1987 baseline case.	Santa Clara County Transit District	Measure is currently being implemented.	$400,000	-Federal Aid Urban Program funds, State ridesharing funds, local Transportation Development Act funds, Urban Mass Transportation Agency Funds.	-Local transit district enabling legialation.

1. Due to the range of benefits from these measures the costs cannot be attributed solely to air quality.

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS

See preceding page.

RECOMMENDATIONS	DIRECT BENEFITS (EMISSION REDUCTIONS, TONS/DAY) 1987	IMPLEMENTING AGENCY(S)	SCHEDULE FOR ACTION A-ADOPTION I-FULLY IMPLEMENTED	TOTAL COST/YEAR OF RECOMMENDED ACTION	FINANCING MECHANISM	LEGAL AUTHORITY
IV. ADMINISTRATIVE PROGRAMS						
1. Advisory Review of Projects and Plans: This program is directed toward new or modified facilities, both public and private, and plans that could result in significant impacts on air quality. The three co-lead air quality planning agencies would review plans and proposals and issue comments related to minimizing their adverse air quality impacts as early in the planning stages as possible. The existing California Environmental Quality Act environmental document process would be used as the primary vehicle for receiving information and communicating advisory comments.	Unknown	Association of Bay Area Governments, Metropolitan Transportation Commission, Bay Area Air Quality Management District	A, I-1982	Unknown	-co-lead air quality planning agencies, existing budgets	-Under CEQA any interested parties may participate in the review-and-comment process -This process, being strictly advisory, would not require further legal authority
2. Conformity Assessment of Federally-Supported Activities: As the area-wide clearinghouse for all Federal grant applications, ABAG's Executive Board comments on Federal grant applications for conformity with regional policies, including provisions of the air and water quality management plans. Hence, assessment of conformity with the provisions of Sections 176(c) and 316 of the Clean Air Act would be formally incorporated into this process. Section 176(c) mandates that agency activities be in conformity with approved plans, and Section 316 outlines the consequences of failure to do so.	Unknown	Association of Bay Area Governments	A, I-1982	Unknown	-existing budgets	-Authority for grant application clearinghouse responsibilities comes from the Federal Intergovernmental Cooperation Act and the Federal Demonstration Cities and Metropolitan Development Act
3. Comprehensive Transportation Plan and Air Quality Analysis of Oakland Central Business District (CBD) Development: Downtown Oakland is currently projected to experience significant growth in the Central Business District which may have adverse impacts on traffic circulation and local air quality. Even with an Inspection/Maintenance Program, the Federal 8-hour CO standard may ultimately be exceeded. Therefore, a study of the collective impacts of this growth on traffic circulation and transit use, which will result in the development of mitigation strategies, is recommended as an action that the City of Oakland should undertake.	Unknown - Carbon monoxide levels are of concern	City of Oakland, ABAG, BAAQMD, and MTC	A-1982 I-1983	Unknown	-City of Oakland to fund the transportation assessment portion with ABAG, BAAQMD, and MTC assisting in preparation of the air quality assessment	-None needed

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
The environmental impacts of these programs is difficult to assess at this time in other than general terms. As the programs involve prevention of adverse effects on environmental quality (including air, water, energy, physical resources, etc.) through studies, advisory review and conformity assessment, it is anticipated that substantial environmental benefits could result. These benefits are heightened by the fact that the programs result in a comprehensive analysis of both the individual and collective impacts of regional activities with environmental consequences, rather than fragmented analyses and recommendations from several different agency review processes. Thus, the reviewee benefits by advice and assessments, and the reviewers benefit by focusing on major environmental problems together.	Institutional o Both of the first two administrative programs utilize institutional structures and policies that are already in existance, and into which these proposed activities fit easily o Where necessary, special relationships would be established with local jurisdictions having air pollution control problems which require individual attention, such as the Oakland CO problem targeted by the third proposal. Financial o As the first two proposed administrative activities are merely more formalized versions of activities that are currently being done by the agencies indicated, there would be no impact on their financial resources. o The impact study of the Oakland CBD would require city funds, which would likely be diverted from other potential uses.	As with the environmental impacts, the economic and social impacts of these programs is difficult to assess at the outset. The existence of coordinated, comprehensive regional plans whose purpose is to minimize adverse and maximize positive effects on economic, social and environmental resources provides a framework within which these two administrative programs will function. Consequently, the review process and comments utilized on these programs will reflect these adopted regional policies and will result in minimal negative and maximal positive impacts on the various resources of concern.	

SECTION II

BACKGROUND OF THE PLAN

The 1979 Bay Area Air Quality Plan was adopted in January 1979 (and subsequently modified in May 1979) and forwarded to the State for incorporation into the State Implementation Plan (SIP). The Bay Area, as defined by the air quality planning boundary shown in Figure 2, was designated under the 1977 Clean Air Act to be a Non-attainment Area for ozone (O_3), carbon monoxide (CO), and total suspended particulates (TSP). The 1979 Plan was prepared in response to the Non-attainment Plan requirements contained in the Act. Following State and federal EPA reviews, it was determined that the 1979 Plan satisfied federal requirements with one major exception: there was no legal authorization for implementation of a motor vehicle inspection and maintenance program.

This document describes revisions to the 1979 Plan that are necessary to solve the Bay Area's air quality problems. The plan addresses air quality standards set by the federal government to protect public health. The plan proposes a range of controls to meet these standards and sets forth an approximate time schedule for adopting and implementing the proposals if the deadlines, as described in the Clean Air Act Amendments of 1977, are to be met.

OZONE

In the 1979 Plan, the Livermore Regional Air Quality Model (LIRAQ) was used to identify a hydrocarbon emissions level of 572 tons per day as the emissions level that would result in attainment of the one-hour .12 ppm federal ozone standard. LIRAQ also indicated that reductions in NO_x emissions would result in increased levels of ozone, therefore no NO_x control programs were included in the 1979 Plan.

In order to achieve a hydrocarbon emissions level of 572 tons, a reduction of 247 tons from the projected 1985 inventory was needed. Table 2 summarizes the programs in the Plan and their expected emission reductions.

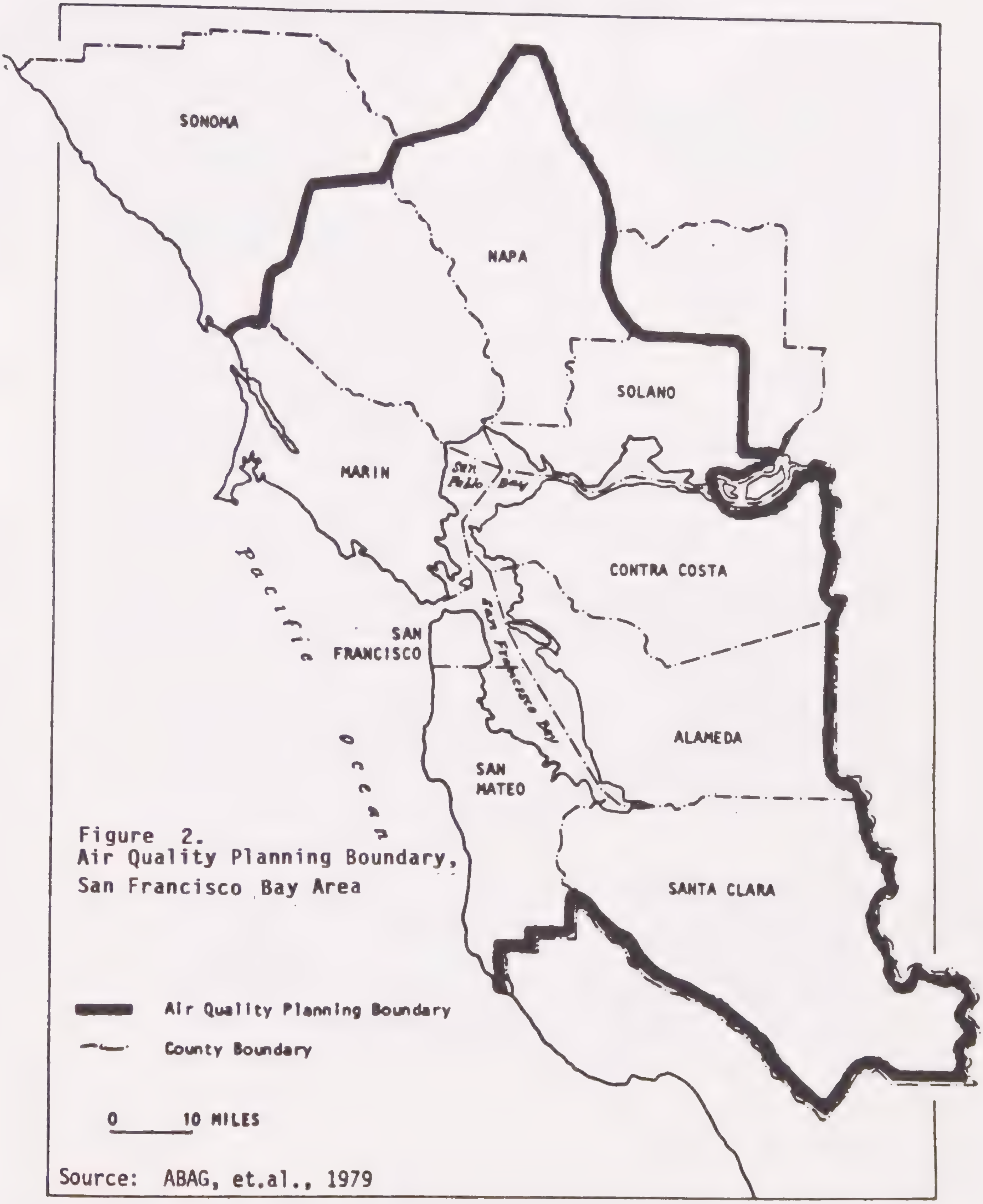


Figure 2.
Air Quality Planning Boundary,
San Francisco Bay Area

Source: ABAG, et.al., 1979

TABLE 2. SUMMARY OF HYDROCARBON EMISSION REDUCTIONS FROM THE 1979 BAY AREA AIR QUALITY PLAN

Control Program		Projected 1985 Hydrocarbon Emission Reduction
o Use of available control technology on existing stationary sources		225 tons/day
o New source review		32 tons/day
o Motor vehicle inspection and maintenance		23 tons/day
o Transportation system improvements		5 tons/day
	Total	285 tons/day

The total emission reduction of 285 tons/day projected from these programs was greater than the amount projected to be necessary for attainment of the ozone standard for two reasons:

- o The California Air Resources Board staff had questioned the emissions estimates for certain source categories based on data that they had recently collected. Since resolution of the issue was expected to require lengthy reexamination and comparison of the data, it was agreed that an allowance for uncertainty of 18 tons/day would be incorporated into the plan.

- o New Source Review was a controversial program at the time and many feared that it would stifle industrial growth in the region. In response to those fears, a growth increment of approximately 20 tons/day was incorporated into the plan. The California Air Resources Board agreed with this under the principal condition that three years of "reasonable further progress" would have to be demonstrated (1979-1981) before the growth increment could be used.

CARBON MONOXIDE (CO)

In the case of carbon monoxide, a linear rollback analysis based on the total Bay Area inventory of CO emissions was used to define the emission reduction requirement. This type of analysis was considered extremely crude, and CO hot spot monitoring was identified as an important task for future work. It was hoped that the additional monitoring would serve to better define the nature and extent of CO problems in the Bay Area. Based on the linear rollback analysis, it was concluded that the programs adopted to reduce hydrocarbon emissions (particularly motor vehicle inspection and maintenance) would also be sufficient to meet the federal 8-hour CO standard of 10 mg/m^3 (9 ppm) by 1985.

TOTAL SUSPENDED PARTICULATES (TSP)

In November 1980, the Bay Area adopted a plan for TSP and forwarded that plan to the State and EPA for approval. The TSP plan indicated that excesses of the federal secondary TSP standard in Santa Clara County were apparently caused by "fugitive dust." Fugitive dust emissions occur from a variety of activities, including construction and demolition, and from motor vehicle travel over paved and unpaved roads. Fugitive dust emissions are difficult to control with current state-of-the-art methods, so the plan called for continued research. It also called for reductions in vehicle-miles-traveled in the San Jose Central Planning Area and consideration of a fugitive dust control rule by the Bay Area Air Quality Management District (BAAQMD).

The Environmental Protection Agency recently acted to approve the TSP plan (47 Federal Register 13140, 3/29/82). EPA has disapproved of the 1979 Plan for ozone and CO due to the lack of legal authority to implement the vehicle inspection and maintenance program (47 Federal Register 11866, 3/19/82). Despite numerous attempts over the past decade, the California Legislature had not been able to agree on an I/M program for the State.

ANNUAL REPORT FOR 1980

In July 1981, ABAG, BAAQMD, and MTC published the San Francisco Bay Area Annual Air Quality Report for 1980. This report summarized the progress made during 1980 to implement the 1979 Plan. The report indicated that:

> "Except for motor vehicle inspection and maintenance, all of the programs adopted in the 1979 Bay Area Air Quality Plan (as modified in May 1979) are being implemented as scheduled. Emissions continued to be reduced in 1980, and substantial further reductions are expected in future years. Air quality in general has improved; however, in the case of ozone the number of days exceeding the federal standard increased slightly in 1980 (compared with 1979).

"At present, we may conclude on the basis of guidelines specified by EPA, that reasonable further progress based on emissions is being made toward attainment of federal air quality standards in the Bay Area. A substantive technical demonstration of this conclusion is not possible at this time due to difficulties in comparing the revised emission inventory estimates with those contained in the 1979 Plan.

"Ambient air quality data suggest that improvements in ozone air quality are not occurring as rapidly as the reduction in hydrocarbon emissions, and this potential divergence of the two trends will be carefully tracked in future annual reports. Ambient carbon monoxide hotspot monitoring data have confirmed that on a localized basis, CO problems are more severe than originally reported in the 1979 Plan.

"The 1982 Plan will include a detailed reevaluation of future air quality and any alternative additional control programs that may be needed."

INSTITUTIONAL ORGANIZATION FOR PLAN PREPARATION

The institutional organization for the preparation of the 1982 Plan relied heavily upon the mechanisms and procedures developed for the preparation of the 1979 Plan. ABAG, BAAQMD and MTC are the co-lead agencies for air quality planning in the Bay Area. Responsibilities for conducting future planning tasks were assigned in a joint memorandum of understanding between ABAG, BAAQMD and MTC. The process for both technical and policy evaluation for this plan was similar to the process successfully used in the preparation of the 1979 Plan. Key working groups and their responsibilities for air quality planning in the Bay Area are summarized below:

- Joint Technical Staff - composed of staff members from ABAG, MTC, BAAQMD, ARB, EPA and the California Department of Transportation (Caltrans). This group was responsible for the development of alternative control strategies and the technical assessment of their effectiveness and impacts.

- Modeling Committee - composed of staff members with specialized air quality modeling expertise from ABAG, MTC, BAAQMD, Caltrans, ARB, EPA, Lawrence Livermore Laboratory (LLL), and Systems Applications, Inc. (SAI). This group was responsible for specification of the air quality modeling methods to be used, and review of the results obtained.

- Air Quality Advisory Committee - composed of interested individuals from private industry, local government staff, and special interest groups. This committee is the vehicle by which progress on plan preparation is communicated to interested individuals and organizations that are not participating directly in the effort. It provides a formal and continuous opportunity for such individuals to

communicate concerns and comments on the work being done, both to staff and the various policy bodies who will be reviewing the plan.

- <u>Joint Management Committee</u> - composed of executive staff of ABAG, MTC, and BAAQMD. This group provides key administrative and policy guidance to the Joint Technical Staff and serves as a bridge between technical staff and the policy review bodies.

- <u>Joint Air Quality Planning and Advisory Committee (JAQPAC)</u> - This nine-member committee has been established to coordinate policy on regional air quality planning, pursuant to the Memorandum of Understanding between ABAG, BAAQMD, and MTC. It is composed of three members from each of the governing bodies of the three co-lead air quality planning agencies for the Bay Area. The JAQPAC has broad responsibility to discuss and recommend solutions to any SIP-related issues, conflicts, problems or policy questions that may arise between or among the agencies. The JAQPAC will make recommendations to the respective governing bodies with regard to SIP-related reports or activities.

- <u>ABAG Regional Planning Committee (RPC)</u> - This committee is composed of elected representatives of cities and counties in the Bay Area, and representatives of special and public interest groups. It functions as the principal policy review body in ABAG for plan development, inheriting the role of ABAG's Environmental Management Task Force.

- <u>ABAG Executive Board</u> - This group is composed of elected representatives of cities and counties in the Bay Area, and functions as the month-to-month governing board for ABAG. All plans and matters of regional policy produced by ABAG must be reviewed and approved by the Board.

- <u>Metropolitan Transportation Commission (MTC)</u> - This group is composed of representatives of cities and counties in the Bay Area, and functions as the governing board for MTC. All plans, funding priorities and policies related to transit and major transportation projects must be reviewed and approved by this Commission.

- <u>BAAQMD Board of Directors</u> - This group is composed of elected representatives of counties in the Bay Area, and functions as the governing board of the BAAQMD. The activities and regulations of the District must receive approval from this Board.

- <u>California Air Resources Board</u> - This body is composed of individuals appointed by the Governor and has the authority to set motor vehicle emission standards. It is also responsible for preparation and submittal of the State Implementation Plan for California to EPA. In addition, it

can override the authority of local air pollution control districts, such as the Bay Area Air Quality Management District, in regulating emissions from stationary sources.

THE 1982 PLAN REVISION

The 1977 Clean Air Act Amendments require those regions which will not attain the ozone and/or carbon monoxide standards by 1982 to submit a revision to their state implementation plan by July, 1982. The focus of this effort in the Bay Area has been in the following areas:

- o Updating plan assumptions - In the time since the 1979 Plan was adopted there have been changes in stationary and mobile source emission factors. The energy situation has also changed substantially. In addition, the air quality and travel models have been updated and refined. All of these changes have been incorporated in the plan revision.

- o Reviewing implementation of adopted controls - The adopted controls have been reviewed to determine their expected effectiveness by 1987.

- o Analyzing new controls - The new controls which have been analyzed include additional stationary source controls, transportation controls, and programs to ensure long-term maintenance of air quality standards.

EPA REQUIREMENTS FOR 1982 SIP REVISIONS

EPA requirements and approval criteria for the 1982 SIP revisions are specified in EPA's final policy "Approval of 1982 Ozone and Carbon Monoxide Plan Revisions for Areas Needing an Attainment Date Extension" (46 FR 7182, January 22, 1981). The basis for this policy is contained in Title 1, Part D of the Clean Air Act Amendments of 1977 (P.L. 95-95). Policy elements are briefly summarized as follows:

Overall, the 1982 SIP is to contain a fully adopted, technically justified program that adopts and commits to implement control measures that will result in the attainment of the O_3 and CO standards no later than 1987, and will provide for reasonable further progress in the interim. The plan must contain three categories of minimum control measures as defined by EPA, and where these are not sufficient to provide for attainment those additional measures which can be implemented by 1987 must be identified and adopted.

The three categories of minimum control measures are reasonably available control technology (RACT) for stationary sources, a vehicle inspection and maintenance program (I/M), and reasonably available transportation control measures (TCMs). The minimum requirement for stationary sources is defined as adopted regulations applying RACT to all sources of volatile organic compounds (VOC) which are covered by a Control Technique Guideline (CTG) document published by EPA, any major

VOC source for which there is no CTG, and all sources of CO emitting more than 1,000 tons per year potential emissions. For I/M, the plan must demonstrate full implementation of the program by December 31, 1982 by providing ten specified elements, e.g., test procedures, emission standards, licensing requirements, etc.

For the TCM portion of the plan, the EPA policy specifies that the following eight elements must be included: 1) an updated emission reduction target for the transportation sector; 2) all reasonably available TCMs from the list contained in Section 108(f) of the Act; 3) commitments, schedules of key milestones and, where appropriate, evidence of legal authority; 4) comprehensive public transportation measures to meet basic transportation needs; 5) a description of the public participation and elected official consultation activities during development of the transportation measures; 6) a monitoring plan to assess the success or failure of the TCMs in achieving the estimated emission reductions; 7) administrative and technical procedures for implementing the conformity provisions of the Act (Section 176 (c)); and 8) a contingency plan that includes a list of projects and planned TCMs which may adversely affect air quality that will be delayed, and a description of the process that will be utilized to initiate the contingency plan.

The plan must demonstrate that reasonable further progress will continue to be made and reported throughout the period of nonattainment. The annual emission reductions must at least equal the emission reductions that would be achieved through a linear attainment program and must distinguish between those reductions projected to result from mobile and stationary source measures.

If the minimum controls summarized above are not sufficient to demonstrate attainment and reasonable further progress within the statutory timeframe, then additional measures must be identified, evaluated, and adopted. These may include the following: application of more stringent controls to stationary sources; application of RACT to a greater number of sources (ie. smaller sources); implementation of a broader range of TCMs; and increasing the coverage and stringency of I/M.

The EPA policy specifies certain process and technical requirements for the 1982 SIP revisions. The process requirements include: conducting consultation among local elected officials, with state and federal agencies to guide developments; joint determination of agency responsibilities for plan development; and joint agreement among affected state and local officials on the emission reduction targets included in the plan. The plan must describe and provide evidence of this consultation. Also, the plan must provide an analysis of the air quality, health, welfare, economic, energy, and social impacts of the measures contained within it.

The technical requirements specified in the EPA policy relate to the air quality data base, the emissions inventory, and the modeling analyses utilized for the plan's development. Generally, EPA requires that the most recent, accurate, and technically defensible data be utilized. This includes the most recent three years of air quality data from the monitoring network, including any special purpose monitoring that was conducted; a 1980 base year emissions inventory where possible; and the use of air quality models which are consistent with EPA guidance documents.

REVIEW OF EXISTING CONTROL PROGRAMS

Many control programs for air pollution currently exist. More are scheduled to be implemented in coming years. Before an examination of potential solutions to our present and projected problems can be conducted, a thorough understanding of existing and planned air pollution programs is needed. These programs have been organized primarily according to implementing authority and/or responsibility.

Existing Stationary Source Controls

In the San Francisco Bay Region, the Bay Area Air Quality Management District (BAAQMD) has been empowered to control air pollution from stationary sources. Since its formation in 1955, the District has developed air pollution control programs for many categories of stationary sources. Over the years the rules have expanded and become more stringent as technology has improved and new techniques for controlling emissions have become available. In the late 1970's the rules were recodified into a new format to facilitate understanding of the rules and provide a framework for future additions.

Regulation 2, Rule 2 (New Source Review) and Regulation 8, Rules 1-28 implement the stationary source controls recommended in the 1979 Bay Area Air Quality Plan. District regulations control air pollution directly by limiting the emission rates of specific contaminants; and also indirectly by curtailing open burning, requiring reformulation of certain products containing organic compounds, and by controlling equipment and operating procedures through the permit system. These rules are among the strictest in the United States.

In addition to its body of local regulations, the District has the broader power to abate a public nuisance that causes "...injury, detriment, nuisance or annoyance to any considerable number of persons ... or which causes ... injury or damage to business or property." (California Health and Safety Code, section 41700.)

In their entirety, District regulations are over a hundred pages long as they contain substantial technical and legal detail, definitions, and lists. A summary of these existing stationary source controls follows. Interested persons may contact the BAAQMD Public Information Office for more detail.

Regulation 1 - General Provisions and Definitions - applicable to all other District regulations. Includes sections on exclusions, breakdown procedures, definition of terms, registration, right of access, sampling facilities, record maintenance and many other provisions.

Regulation 2 - Permits - specifies the requirements for Authorities to Construct and Permits to Operate.

Rule 1 - General Requirements - includes procedures for issuance or denial of permits or authorities, exemptions, appeals against decisions of the APCO and District action on applications.

Rule 2 - New Source Review - applies to new or modified sources which emit more than 150 pounds per day of certain pollutants.

Rule 3 - Power Plants - contains special provisions for the review, and standards for the approval of, Authorities to Construct power plants within the District.

Regulation 3 - Fees - establishes fees to be charged for Hearing Board filings, permits, and other District services.

Regulation 4 - Air Pollution Episode Plan - establishes control and advisory procedures for extra emissions reductions during days when high pollutant concentrations have been measured or are expected. Different actions are specified for three defined stages of alert, and are intended to protect health under adverse conditions.

Regulation 5 - Open Burning - generally prohibits open burning, but also allows for exemptions such as cooking and recreational fires. Also allows conditional exemptions for agricultural burning, disposal of hazardous materials, fire training, and range/forest/wildlife management.

Regulation 6 - Particulate Matter and Visible Emissions - limits the quantity of particulate matter in the atmosphere by controlling emissions rates, concentrations, visible emissions and opacity.

Regulation 7 - Odorous Substances - establishes general limitation on emissions of odorous substances, and specific concentration limits on emissions of certain chemical compounds known to be odorous.

Regulation 8 - Organic Compounds - limits organic pollutants, which are the important precursors of ozone, as follows:

Rule 1 - General Provisions - purpose, definition, exemptions.

Rule 2 - Miscellaneous Operations - limits emissions to 300 ppm carbon and 15 pounds per day.

Rule 3 - Architectural Coatings - limit of 250 grams of volatile organic compounds per liter of coating as applied, excluding water.

Rule 4 - General Solvent and Surface Coating Operations - provides limits on container size (1 liter) and sale volumes (210 liters) for non-complying solvents; limits organic emission rates (450 lb/hr and 3000 lb/day) for complying solvents; limits emission rates (3 lb/hr and 15 lb/day) of organic solvent from heated operations.

Rule 5 - Storage of Organic Liquids - limits emissions from storage tanks containing organic liquids with vapor pressure above 1.5 psia. Limits depend on size and type of tank; some are specified in terms of type of seal to be used.

Rule 6 - Terminals and Bulk Plants - limit of 0.65 lb of organic emissions per 1000 gallons loaded. Specifies equipment and operation of tanks, trucks, and loading racks, with exemptions for small sizes.

Rule 7 - Gasoline Dispensing Facilities and Gasoline Delivery Vehicles - requires that delivery vehicles, storage tanks, and dispensing equipment be equipped to attain 90% reduction from uncontrolled emissions.

Rule 8 - Wastewater (Oil-water) Separators - specifies cover, seal, and operating conditions, and requires 90% reduction in emissions.

Rule 9 - Vacuum Producing Systems - requires collection of organic emissions from vacuum producing systems at petroleum refineries.

Rule 10 - Process Vessel Depressurization - requires collection and control of organic compound emissions from depressurizing any process vessel at a refinery during turnaround.

Rule 11 - Metal Container, Closure and Coil Coating - limits of 200 to 660 grams VOC per liter, excluding water, for various coatings. Alternative compliance of 120 gm/l emissions for coil coating.

Rule 12 - Paper, Fabric and Film Coating - limit of 120 gm VOC emissions per liter of coating applied, excluding water.

Rule 13 - Light- and Medium-duty Motor Vehicle Assembly Plants - limits VOC content (145 to 590 grams per liter) for various kinds of paint used; allows alternative equivalent control.

Rule 14 - Surface Coating of Large Appliances and Metal Furniture - limits VOC content of coatings to 275 grams per liter for baked finishes and 340 grams per liter for air-dried finishes; allows equivalent level of control. Requires electrostatic application or 65% transfer efficiency.

Rule 15 - Cutback Asphalts - prohibits use of rapid-cure liquid asphalt; prohibits use of cutback asphalt from April to October; prohibits use of emulsified asphalt with greater than 3% petroleum solvent.

Rule 16 - Solvent Metal Cleaning Operations - requires covered container, drained solvent return, posted operating procedures. Specifies solvent types, vapor pressure limits, equipment requirements, and operating procedures for solvent degreasers.

Rule 17 - Dry Cleaners - requires vapor condensation or 85% reduction or 100 ppm limit on exhaust gases from drying tumblers and cabinets.

Rule 18 - Valves and Flanges at Petroleum Refinery Complexes - limits leak rate from valves and flanges to measurement of 10,000 ppm at one centimeter distance, and sets schedules for required repairs.

Rule 19 - Surface Coating of Miscellaneous Metal Parts and Products - limits VOC content of coatings to 275 gm/liter for baked coatings and 340 gm/liter for air-dried coatings. Requires electrostatic application or 65% transfer efficiency. Allows alternate equivalent controls.

Rule 20 - Graphic Arts Coating Operations - requires low-solvent ink or 85% overall control from publication gravure; 75% from packaging gravure, wall paper screen printing, flexographic printing, detergent packages, etc. Allows alternate equivalent controls.

Rule 21 - Rubber Tire Manufacturing Operations - requires emission collection device and 95% control on cementing and bead dipping devices; water-base coatings or 90% collection and 95% control of emissions from green tire coating; allows alternate equivalent control.

Rule 22 - Valves and Flanges at Chemical Plant Complexes - limits leak rates to measurement of 10,000 ppm (as methane) at 1 cm distance, and sets repair schedules.

Rule 23 - Coating of Flat Wood Paneling - limits emissions to 6 to 12 lb per 1000 square feet of finished products. Requires low-solvent coatings, 90% control by incineration, or equivalent.

Rule 24 - Manufacture of Synthesized Pharmaceutical Products - provides emission limits or control requirements for reactors, crystallizers, centrifuges, rotary vacuum filters, tanks, and dryers used in pharmaceutical manufacture.

Rule 25 - Pumps and Compressor Seals at Petroleum Refineries - limits leak rates to a measurement of 10,000 ppm (as hexane) and sets repair schedules.

Rule 26 - Magnet Wire Coating Operations - requires use of coatings with less than 200 gm/liter VOC or 90% control.

Rule 27 - Perchloroethylene Dry Cleaning Operations - requires carbon adsorber or 90% reduction or 100 ppm limit on exhaust gases from drying tumblers and cabinets.

Rule 28 - Pressure Relief Valves at Petroleum Refineries - requires that relief valves reseat on depressurization, or vent to 90% control device, or be protected by a rupture disk.

Rule 29 - Aerospace Coatings - rule now in development stage.

Regulation 9 - Inorganic Gaseous Pollutants - limits emissions and ground level concentrations of the following:

Rule 1 - Sulfur Dioxide - limits most sources to 300 ppm, with no resulting ground level concentrations above state or federal ambient air quality standards; ships to 2000 ppm or 3.34% sulfur fuel. Other fuel burning limited to 0.5% sulfur or 300 ppm. Separate limits for sulfur recovery plants, sulfuric acid plants, fluid catalytic cracking units, cokers, coke calcining kilns, and catalyst manufacturing plants.

Rule 2 - Hydrogen Sulfide - prohibits emissions which result in ground level concentrations exceeding 0.06 ppm for 3-minute average, or 0.03 ppm for one-hour average.

Rule 3 - Nitrogen Oxides from Heat Transfer Operations - for large sources (1.75 billion BTU/hr), limits NOx emissions to 175 ppm on gas and 300 ppm on liquid fuel. Limits are 125 and 225 ppm for new or modified 250 million BTU/hr sources.

Rule 4 - Nitrogen Oxide from Fan Type Central Furnaces - limits home furnaces to 40 nanograms per joule useful heat; mobile home furnaces to 50 ng/J.

Rule 5 - Hydrogen Sulfide from Geothermal Power Plants - limits power plants, steam supplies, and wells.

Regulation 10 - New Plant Performance and Emission Requirements - establishes emission and/or performance requirements for the following new and modified sources: steam generators, solid waste incinerators, Portland cement plants, nitric acid plants, sulfuric acid plants, asphalt concrete plants, petroleum refineries, storage vessels for petroleum liquids, secondary lead smelters, secondary brass and bronze ingot production plants, iron and steel plants, sewage treatment plants,

phosphate fertilizer plants, steel plant electric arc furnaces, primary aluminum reduction plants, primary copper/zinc/lead smelters, coal preparation plants, ferroalloy production facilities, kraft mills, grain elevators, electric utility steam generating facilities, gas turbines, glass manufacturing plants, and ammonium sulfate manufacturing.

Regulation 11 - Hazardous Pollutants - sets emission and/or performance standards for hazardous pollutants as follows:

Rule 1 - Lead - Limits lead emissions to 15 pounds per day and prohibits ground level concentrations above 1 microgram per cubic meter, 24-hour average.

Rule 2 - Asbestos - prohibits certain uses of asbestos, visible emissions from mill or product fabrication; also specifies procedures for removal, demolition, and waste disposal of asbestos-containing materials.

Rule 3 - Beryllium - limits emissions to 10 grams per day, or ground level concentrations to 0.01 micrograms per cubic meter, 30-day average.

Rule 4 - Beryllium - Rocket Motor Firing - limits emissions from test sites and combustion product tanks.

Rule 5 - Mercury - limits emissions from ore processing to 2.3 kg per 24-hour period; sludge incineration plants to 3.2 kg per 24 hr.

Rule 6 - Vinyl Chloride - limits emissions from vinyl chloride manufacturing plants.

Regulation 12 - Miscellaneous Standards of Performance - establishes emission and/or performance standards for plants and operations that are not otherwise included in District regulations.

Rule 1 - Kraft Pulp Mills - limits total reduced sulfur emissions to 15 ppm average during operating hours, and to 0.3 lb per ton of pulp produced.

Rule 2 - Rendering Plants - requires incineration or equivalent control of effluent gases.

Rule 3 - Asphalt Air Blowing - requires incineration or equivalent.

Rule 4 - Sandblasting - limits visible emissions, procedures, and abrasive size.

Rule 5 - Phosphate Fertilizer Plants - limits fluoride emissions from certain storage and manufacturing facilities.

Rule 6 - Acid Mist from Sulfuric Acid Plants - limit of 0.3 lb per ton of acid produced.

Motor Vehicle Emission Controls

The California Air Resources Board (CARB) is the State agency responsible for coordinating both State and federal air pollution control programs in California. This responsibility includes regulation of pollutant emissions from motor vehicles and coordination of local programs for stationary source control.

Due to the severity of air pollution problems in California, the federal government gives the State the option of enforcing motor vehicle emission standards which are more stringent than federal emission standards. Thus, while the Environmental Protection Agency takes primary responsibility for motor vehicle emissions control, the CARB can and has adopted and enforced emission standards more stringent than required at the federal level. This section summarizes CARB responsibilities for mobile source control.

The CARB currently has regulations which control emissions from light-, medium- and heavy-duty gasoline powered vehicles, diesel powered trucks and buses, and motorcycles. In addition, the CARB has in effect various regulations and procedures to ensure that emission standards are met. Appendix K presents current vehicle emission standards adopted by the CARB.

In the 1979 Bay Area Quality Plan, two actions were proposed to reduce motor vehicle hydrocarbon and carbon monoxide emissions. These actions were as follows:

o Implement more stringent vehicle emission standards - this measure was included in the plan to ensure long-term maintenance of the ozone and carbon monoxide standards;

o Implement an inspection/maintenance program for light- and heavy-duty vehicles statewide - this measure was included in the plan for attainment of the ozone and carbon monoxide standards by 1985-87.

The following paragraphs describe the current implementation status of these actions.

More Stringent Vehicle Emission Standards. The Air Resources Board amended the State Implementation Plan to include commitments for study by the State of nine control measures affecting mobile sources. Included among the nine control measures to be examined further by the ARB is one referred to as "Electric-Powered Vehicles and Stricter Emission Standards for Light-Duty Vehicles." In the revised Chapter 4 of the State Implementation Plan, the ARB indicated this measure is intended to emphasize the consideration of incentive measures designed to promote the development and production of electric-powered vehicles which could be utilized in urban areas. The Board acknowledged the rapid changes being made in vehicle emission control technology, and directed the staff to continue optimization of light-duty vehicle emission controls, including consideration of stricter emission standards.

Inspection/Maintenance. A motor vehicle inspection and maintenance (I/M) program is a vital link in the overall strategy for control of vehicle emissions, and such a program was adopted in the 1979 Plan. The California Legislature has considered proposals for an automobile inspection and maintenance program for more than a decade. As a result of the 1977 Amendments to the Clean Air Act, efforts to authorize such a program increased.

The most recent version of I/M legislation, SB 33 (Presley), was signed into law on September 10, 1982. Cost and effectiveness estimates for I/M vary widely depending upon the assumptions made about how it will ultimately be designed, implemented, and enforced. The most recent data from EPA indicate that a 25 percent reduction in hydrocarbon and carbon monoxide emissions from automobiles is a reasonable estimate of the effectiveness of an I/M program within the provisions of SB 33. This translates to emission reductions of approximately 29 tons of hydrocarbons and 367 tons of carbon monoxide in the Bay Area.

Aside from I/M for light- and medium-duty vehicles, ARB is developing antitampering regulations for on-highway heavy-duty vehicle engines. This program will become important in later years when the emission standards for new heavy-duty vehicles take full effect. Preliminary estimates indicate that by 1987 an emission reduction of roughly 0.2 tons/day of hydrocarbons and 16 tons/day of carbon monoxide may be achieved by this measure.

Transportation Control Programs

The Bay Area has a long history of efforts to encourage alternative modes of transportation and thus reduce dependence on the automobile. The Regional Transportation Plan states that "Priority shall be given to projects or programs that reduce dependence on automobile travel and conserve energy, including projects that enhance or complement pedestrian, bicycle, car/van pool, and transit travel." The following is a summary of some of these efforts:

Transit Service

- The BART system was built almost entirely with local funds.

- The established transit systems in the Bay Area (AC Transit, S.F. MUNI, and the Southern Pacific) have been improved and expanded in the last decade. In addition, a number of new systems (Golden Gate Transit, Santa Clara Transit, SamTrans, and Central Contra Costa Transit) have begun service. The percentage of commuters travelling on transit in the San Francisco/Oakland metropolitan area rose from 14.97% in 1970 to 17.47% in 1980. Over this same period transit ridership was declining in most other areas of the U.S.

o Nearly $580 million is spent annually in support of transit in the Bay Area.

o The region has continually sought additional funds for transit. Alameda, Contra Costa, San Francisco, San Mateo, and Santa Clara counties all levy an additional 1/2-cent sales tax to support transit operations. MTC raised bridge tolls in 1977 to generate an additional $8 million/year for transit capital. Golden Gate Transit is subsidized by tolls from the Golden Gate Bridge.

Ridesharing

o RIDES, a non-profit corporation funded by MTC and Caltrans, provides carpool matching services in the Bay Area and also facilitates vanpool formation.

o Carpools are allowed free passage on the major bridges crossing the Bay during commute hours.

o High-Occupancy Vehicle lanes are provided on I-280 in San Francisco, I-580 through the Dublin Canyon, the approach to the Bay Bridge, and Rte. 101 in Marin County. San Francisco has exclusive bus lanes on a number of its city streets.

o Caltrans provides free parking for vanpools in downtown San Francisco. Caltrans also opened 50 fringe parking lots for use by bus and carpool patrons in the region.

Bicycle Programs

o 2% of Transportation Development Act funds in this region are earmarked for bicycle and pedestrian projects. In the 1981-82 fiscal year, these funds totalled over $1.6 million.

o Bike lockers are provided at many BART and Southern Pacific stations. Bicycles can be carried on BART during non-commute hours.

o Palo Alto enacted a bicycle parking ordinance that requires bicycle parking facilities at new developments.

Employer-Based Programs

o MTC, through its Commute Alternatives Program, conducts training sessions for transportation coordinators. These coordinators are designated by their employers and assist other employees in finding alternative modes for commuting. MTC has produced a training manual and has held 3 training sessions thus far.

o A flextime demonstration program was conducted with major employers in San Francisco in an attempt to reduce congestion by spreading the commute times.

Auto Restraints

- o The Bay Area was one of the first metropolitan areas in the nation to reassess its freeway construction program. Some projects, such as the Southern crossing, were stopped upon voter insistence.

- o The City of Berkeley installed a system of traffic diverters to keep through-traffic out of residential neighborhoods. However, a recent ruling by the California Supreme Court may end this program.

It is evident that much as been done in the Bay Area to encourage alternatives to the automobile. In the 1979 Air Quality Plan, five specific transportation measures were adopted by MTC. These measures are reaffirmed in the current plan. The following summarizes the progress to date and the proposed efforts for these measures:

1. Transit Service Increase

   Ridership on the six major transit systems in FY 1980-81 totalled 319.1 million, which is 26.1% above the 253 million riders in FY 1977-78. This is above the targeted increase of 16.8% (3 years progress toward the 5-year, 28% goal).

   The transit operators have updated their 5-year plans and adopted budgets for FY 1981-82. Cuts in federal subsidies make it quite difficult to expand the systems, and fares are being increased on most systems this year. The operators anticipate that additional transit growth in the near future can be accommodated through productivity improvements. This measure is reaffirmed in the current plan as TCM #1.

2. Bicycle Facilities

   A draft regional bicycle plan has been prepared by MTC. This plan contains policies to direct MTC's administration of Transportation Development Act funds which are earmarked for bicycle/pedestrian projects. In addition, a number of actions which MTC can take to encourage bicycle use are identified. This plan was incorporated into the RTP in October of 1982.

   The effectiveness of this measure has been re-estimated in the current air quality plan. This measure will be implemented through the local government information program (TCM #10).

3. Encourage Ride Sharing

RIDES, a non-profit corporation funded by Caltrans and MTC, is the primary agency for ridesharing services in the Bay Area. RIDES provides carpool matching services and also facilitates vanpooling. RIDES had 272 vans in operation as of June, 1981. From surveys conducted by RIDES, it is estimated that the carpool and vanpool efforts over the last year reduced HC by 0.36 tons/day, and CO by 4.06 tons/day. This is consistent with the schedule assumed in the 1979 plan.

Funding will continue for RIDES and other ridesharing agencies in the next fiscal year. RIDES intends to concentrate on outreach services to employers in an attempt to expand their market. TCM #5 in the current plan reaffirms this measure.

4. Preferential Parking for HOVs

Caltrans is the primary agency working on this measure. Caltrans has opened approximately 50 fringe parking lots in the region to facilitate bus, carpool, and vanpool usage. Caltrans also administers 11 privately-owned park-and-ride lots. Free vanpool parking in downtown San Francisco is also provided through another Caltrans program. At present, approximately 200 vans make use of this program.

Although it was not possible to quantify the emissions reductions from this program, the level of effort suggests that the total program will achieve the 1985 targeted emissions reductions of 0.1 tons/day of HC and 1.5 tons/day of CO. This measure is reaffirmed in the current plan as TCM #7.

5. Provide HOV Lanes/Ramp Metering

A number of HOV projects have been implemented in the Bay Area. Included are HOV lanes on I-580 through the Dublin Canyon, Rte. 101 in Marin County, I-280 in San Francisco, and the Bay Bridge Approach. Ramp metering with HOV bypasses are provided on I-280, Rte. 17, and Rte. 101 in Santa Clara County. A new HOV lane from Grand Avenue to the Bay Bridge has just been opened in the last year.

Again, it is difficult to estimate the effects of this program because of the problem of isolating the effects of the HOV facilities from other ridesharing and transit incentives. It is expected, however, that these efforts will achieve the 1985 emissions reductions target of 0.2 tons/day of HC and 1.5 tons/day of CO. This measure is reaffirmed in the current plan as TCM #4.

SECTION III

PRESENT AND PROJECTED EMISSIONS, AIR QUALITY, AND EMISSION REDUCTION TARGETS

PRESENT AIR QUALITY

The Bay Area Air Quality Management District maintains and operates an extensive air quality monitoring network throughout the region. Data are collected regularly for pollutants which have air quality standards established. The five pollutants for which federal standards have been established are sulfur dioxide (SO_2), total suspended particulate (TSP), carbon monoxide (CO), nitrogen dioxide (NO_2) and ozone (Ox). Brief summaries of air quality levels experienced in the Bay region are given below. More detailed discussions may be found in Tech. Memos 32 (Sandberg, et al., 1980) and 37 (Sandberg, et al., 1981).

Sulfur Dioxide -- In 1979 there were no excesses of State or federal sulfur dioxide standards at the 20 community monitoring stations. All showed decreases from long-term and 1978 annual averages. The decrease was sharpest at the industrial community stations of Contra Costa County, all of which were at least 85% below the federal annual (.03 ppm) standard.

Total Suspended Particulates -- The annual geometric means of total suspended particulate continued to show a pattern of low values near the coast increasing with distance inland, particularly in dry, sheltered valleys. Isopleths of TSP increase from a 35 ug/m^3 background value parallel to the coast to near 60 ug/m^3 at the most inland valley sites. Urban centers such as San Francisco and Richmond appear to add 5-8 ug/m^3 to the maritime background levels.

Nitrogen Dioxide -- The federal standard for nitrogen dioxide is not exceeded in the Bay Area. In addition, in 1979 there were no excesses of the State .25 ppm hourly standard at any station for the first time in 13 years of continuous monitoring. Maximum-hour averages for the NO_2 season show a 10% decrease from 1978.

Carbon Monoxide -- Maps of annual average ambient concentrations are of little value for carbon monoxide, since over 90% of the CO is emitted from vehicular sources, resulting in a complex, latticed pattern corresponding closely to highway networks. These tail-pipe level emissions are also particularly sensitive to low-level radiation inversons, resulting in very strong daily and seasonal cyclic variations.

Despite the large number of motor vehicles in the Bay Area, the federal and State one-hour CO standards have not been exceeded in the current decade. However, the federal 8-hour average standard of 10 mg/m^3 (9 ppm) has been exceeded frequently in some areas. The major excess area is the Santa Clara Valley, centered on San Jose. There are isolated urban-center cases at other sites.

To explain this peculiar pattern one must examine the seasonal and daily cycles in the data. In the past 10 years there have been no CO excesses from March through August. Over 80% of the excesses occur in November, December, and January. On a daily basis over 90% of these 8-hour excesses occur between 4 p.m. and 2 a.m. There is an intense but short maximum from 7 to 9 a.m., followed by low levels from 10 a.m. to 4 p.m. Then, since the winter-season formation of surface-based radiation inversions corresponds to the evening traffic maximum, the sustained build-up of high CO levels occurs. There is also a day-of-week factor, with greatest frequency of excesses on Friday, the maximum vehicle use day. Typically, the Bay Area's highest CO values are recorded near 11 p.m. on Friday nights in downtown San Jose. Hopefully, this targeting of the excesses in time and space may suggest the most precise and cost-effective control strategies.

The number of 8-hour CO excesses has decreased from 69 days in 1976, 41 days in 1977, and 24 days in 1978 to 21 days in 1979. A secondary maximum over Vallejo has disappeared. However, measured ambient CO levels have decreased less rapidly than total emissions, possibly because the ambient values in this air basin are most sensitive to winter evening driving modes and patterns.

Ozone

In February 1979 the federal standard for "photochemical oxidants" was changed to "ozone", the major component of the oxidant mix and the one primarily measured. To allow for the wide year-to-year variations in ozone observed nationally (as well as locally) the new federal standard is based on a running 3-year average, called the Expected Annual Exceedance, of days with maximum hourly concentrations above 12 pphm. On a site-specific basis, this average is not to exceed one day per year.

The compliance status of District monitoring stations for 1979 with respect to this standard is shown in Figure 3. Of 26 monitoring sites, 14 meet the federal standard, with the exceedances (bounded by the 1-day line on ozone map) centered in the Santa Clara, Livermore, and Diablo Valleys. Exceedance values are zero near the coast and across San Francisco and Oakland, increasing inland, particularly in sheltered valleys. The map is particularly encouraging in terms of population exposure, with some 56% of Bay Area population in attainment areas. In recent years only the Los Gatos area has averaged more than 10 ozone exceedance days per year. By comparison, the maximum number of exceedances in 1969 (more than 40 days) was in the Livermore Valley, within the 10-day exceedance line encompassing all three valleys, as shown in Figure 4.

Figure 5 summarizes 15 years of Bay Area ozone data for various levels of occurrence, including the current .12 ppm (12 pphm) standard and the .20 ppm (20 pphm) advisory level. Also graphed are ozone season average trend values and inventoried hydrocarbon/oxides of nitrogen ratios. The trend study, based on seasonal high-hour ozone averages for comparable days with high temperatures and low inversions, shows a 40% decrease in the 7-station average over 15 years, for a 2.7% per year

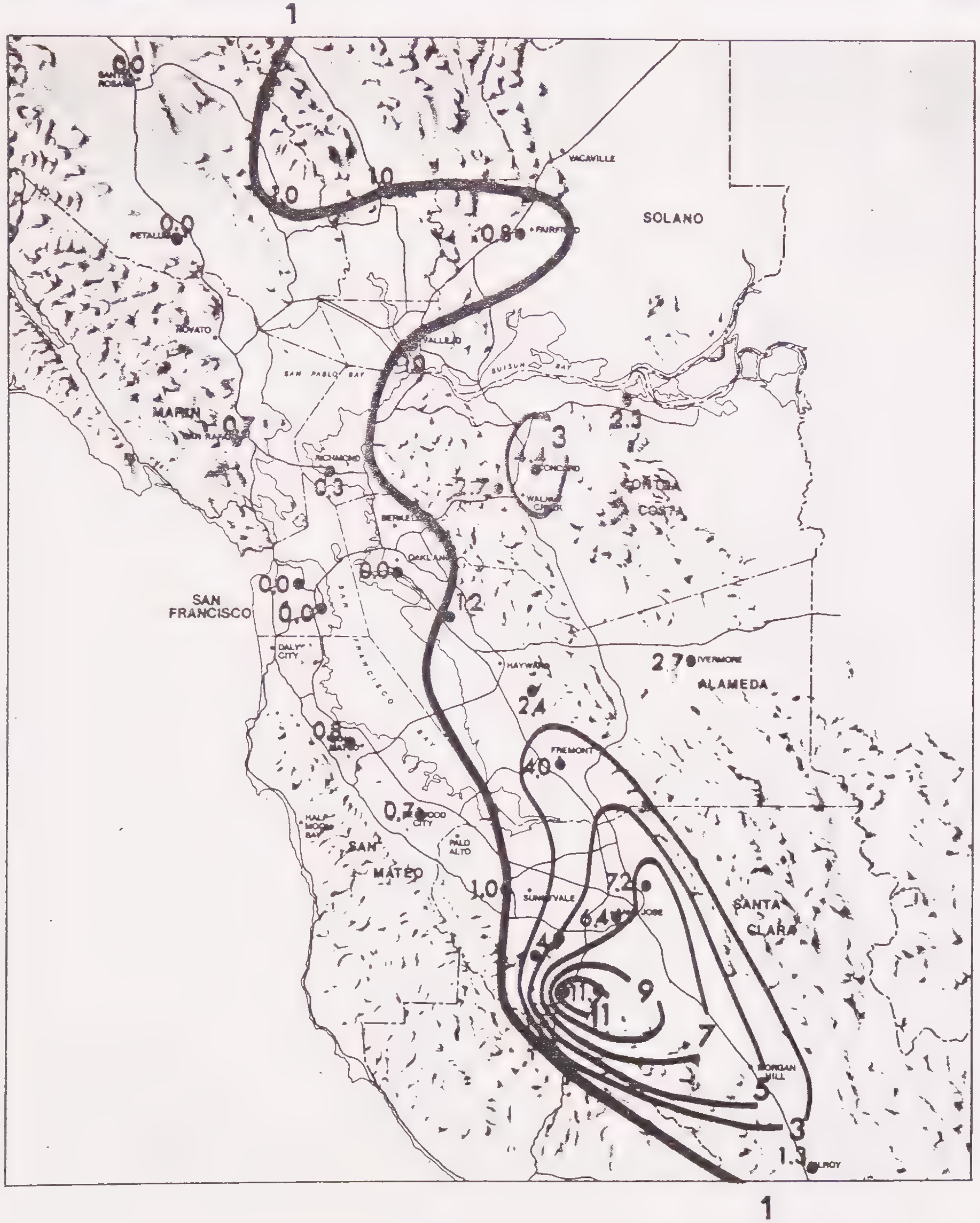


Figure 3. 1979 Expected Annual Exceedances of Federal Ozone Standard in days per year with maximum hourly ozone concentration exceeding .12 ppm, based on 3-year average (1977-1979)

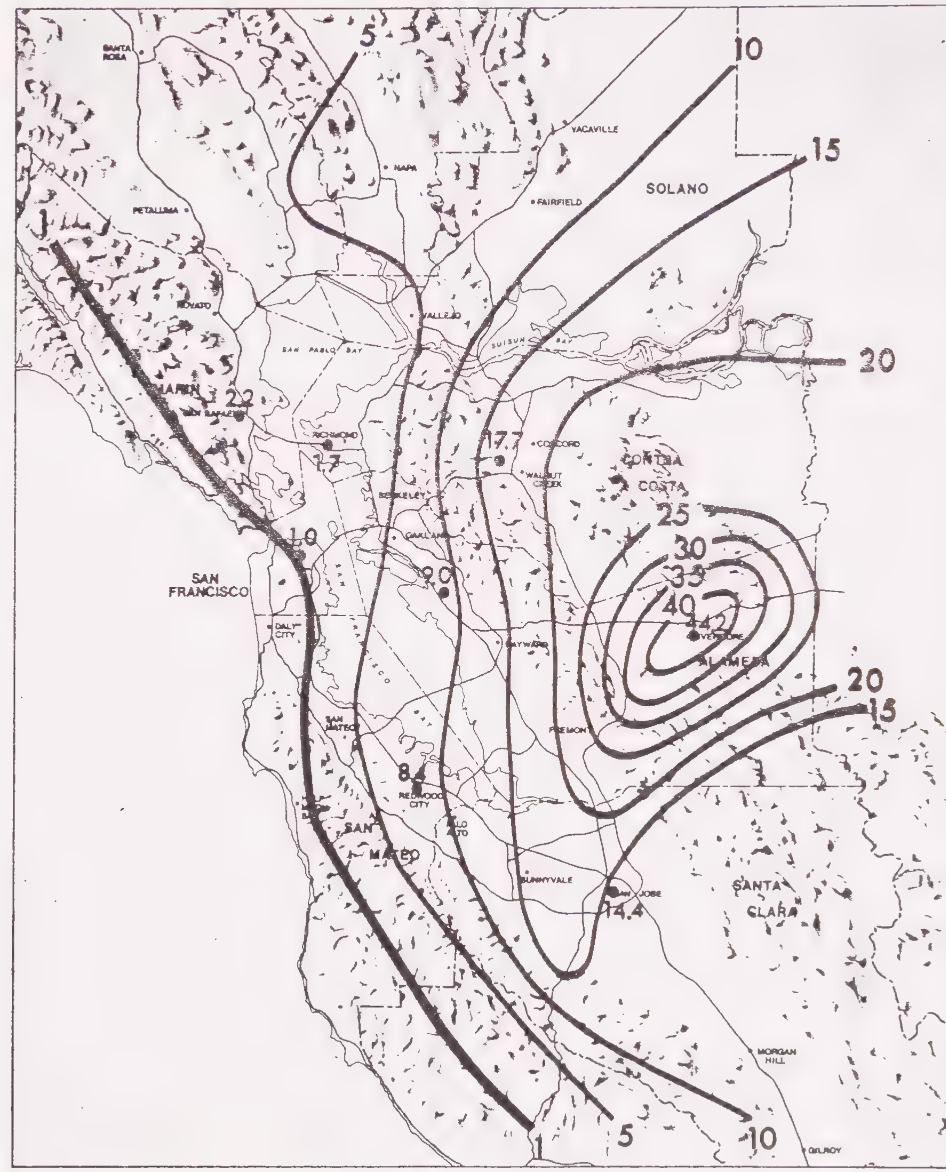


Figure 4. 1969 Expected Annual Exceedances of Federal Ozone Standard in days per year with maximum hourly ozone concentration exceeding .12 ppm, based on 3-year average (1967-1969)

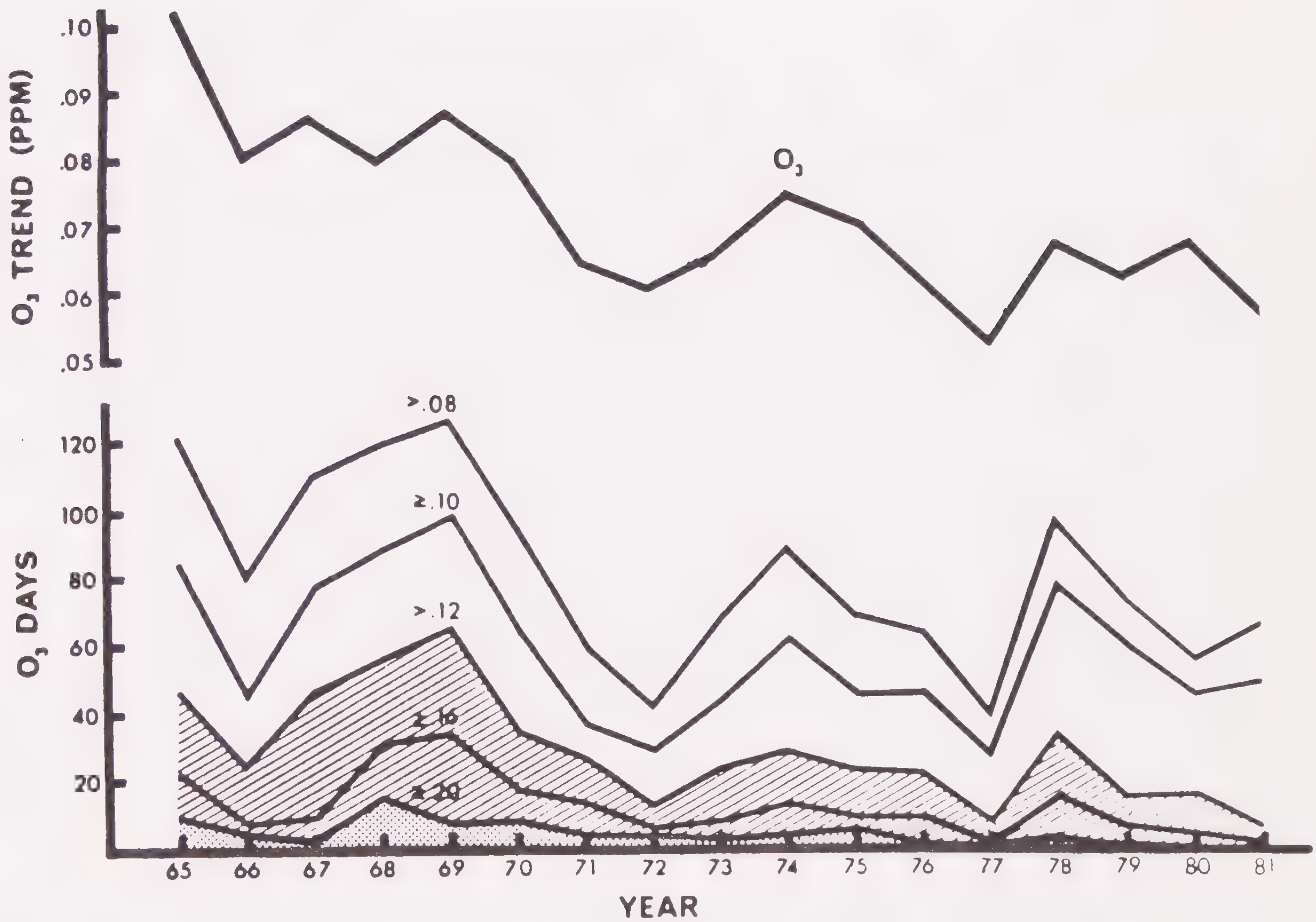


Figure 5. Ozone Trends, 1965-1981

Lower graph lines show annual occurrence of days with any station exceeding various ozone levels: .08, .10, .12, .16 and .20 ppm. The Federal standard of .12 ppm is shaded. In upper graph, the heavy "trend" line shows the mean annual ozone values on comparable days with warm temperatures and low inversions; the thin line shows HC/NO_x ratios from annual emission inventories.

decrease. The closely comparable decrease in hydrocarbon/oxides of nitrogen ratios from emissions inventories over the same period would serve to support current hydrocarbon-directed control strategies. Local differences in the rate of improvement suggest that high growth continues to counterbalance increased control in some sections of the District.

PRESENT AND PROJECTED EMISSIONS

This section presents a summary of present and projected emissions of five major air contaminants for the San Francisco Bay Region. The purpose of the emissions inventory is to identify each significant source of pollutants contributing to the air quality problems of the region. In some cases it is possible to identify a single category of sources as being the major contributor to a given problem (e.g., carbon monoxide from motor vehicles or sulfur dioxide from fuel combustion in electrical generating plants). In other cases, such as ozone, no single category of sources can be identified as the root of the problem. By identifying the most significant sources, the emissions inventory provides direction for efforts to control emissions and therefore minimize the problems they cause. Thus, the inventory is a crucial prerequisite to the development of any plan to improve air quality.

In order to develop a long range plan to improve air quality, it is necessary to know not only what current emission levels are, but what future emission levels will be. Future emissions are derived from present emissions in each category of sources, combined with energy assumptions and estimates of growth rates as described in Tech. Memo 34 (Crouse, et al., 1981) and the expected effects of control programs which are in effect now or adopted and scheduled for implementation. The projected emissions thus reflect normal growth trends.

The Bay Area Air Quality Management District (BAAQMD) prepared a detailed emissions inventory from all sources except motor vehicles and vegetation. The motor vehicle emissions estimates were made through the joint efforts of the Association of Bay Area Governments (ABAG), Metropolitan Transportation Commission (MTC) and California Air Resources Board (ARB). The emissions from vegetation were estimated by the ABAG. Emission inventories for the Bay Area for the years 1975, 1979, 1987 and 2000 are summarized in Appendix E and Table 3. Future year emissions will be influenced by the availability of natural gas and the trade off between newer vehicles with lower emissions and increased vehicle use. Future trends in organics, oxides of nitrogen and carbon monoxide emissions are graphically shown in Figure 6.

Organic emissions are expected to continue a downward trend due to motor vehicle controls and the implementation of the BAAQMD's Regulation 8 on organic compounds. After 1987 the organic emissions show increases due to normal growth. Oxides of nitrogen emissions are expected to decline due to controls on motor vehicles, and then increase due to normal growth. Carbon monoxide emissions are expected to decline due to existing controls on motor vehicles.

TABLE 3. SAN FRANCISCO BAY AREA EMISSION INVENTORY SUMMARY, 1979-2000

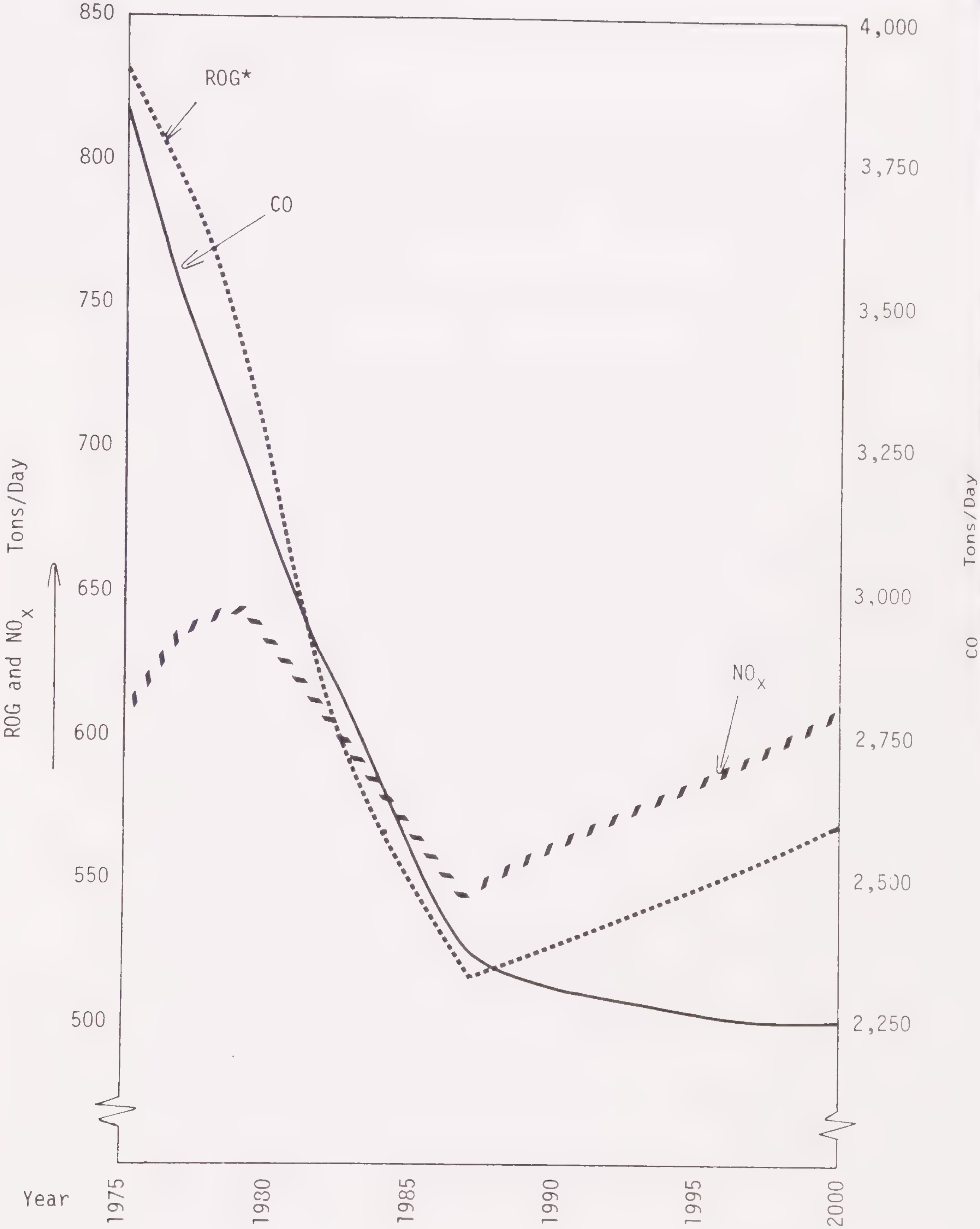
Emissions (Tons/Day)

Year		Particulate Matter	**Reactive Organics (ROG) or Hydrocarbons (HC)	Nitrogen*** Oxides (NOx)	Sulfur Dioxide (SO2)	Carbon Monoxide (CO)
1979	Stationary	205	359	321	177	264
	Motor Vehicle	34	310	310	17	2870
	Other	240	63	12	1	80
	Total	479	732	643	195	3220*
1987	Stationary	221	275	344	161	301
	Motor Vehicle	30	172	186	20	1940
	Other	285	68	14	1	95
	Total	536	515	543*	182	2340*
Percent Change, 1979-1987		+12%	-30%	-16%	-7%	-27%
2000	Stationary	241	311	407	197	341
	Motor Vehicle	47	176	182	34	1760
	Other	361	82	21	2	145
	Total	649	569	610	233	2250*

*Totals may differ slightly due to round-off convention employed.

**Does not include Biogenic Hydrocarbon Emissions which have been estimated in Tech. Memo 35 (Hunsaker and Moreland, 1981) to be over 400 tons/day for the nine-county Bay Area.

***NO_x tonnage reported as NO_2.



* Reactive organics are essentially equivalent to non-methane hydrocarbons; these figures do not include biogenic hydrocarbon emissions.

Figure 6. Baseline Emission Inventory Projections, 1975-2000, for Reactive Organics (Hydrocarbons), Oxides of Nitrogen, and Carbon Monoxide.

Stationary Source Emissions

The BAAQMD has refined its 1979 inventory, estimating emissions from 152 source categories, compared to 107 previously used in the 1975 inventory. In addition, detailed emission estimates were prepared for 208 major companies compared to 116 in 1975. The most significant changes between 1979 and 1975 are as follows:

- Generally, emissions from major companies have shown differences due to the more detailed emissions computations used for 1979.

- The decrease in sulfur dioxide emissions from chemical manufacturing from 85 tons/day in 1975 to 48 tons/day is attributed to better controls at refineries and acid plants.

- The decrease in filling station emissions is attributed to vapor recovery controls at the filling stations.

- The decrease in emissions from solvent storage tanks, degreasers, rubber and plastics manufacturing is attributed to better information available now.

- Emissions from storage tanks are estimated using new emission factors contained in "Compilation of Air Pollutant Emission Factors" AP-42 by EPA.

- The addition of the following new categories has increased emissions estimates considerably:

  - Wineries, breweries
  - Pesticides usage
  - Construction operations
  - Demolition operations
  - Oil and gas production fields
  - Lightering, marine vessel transfer
  - Consumer solvent usage (products such as aerosols, toiletries, waxes, polishes, cleaners, etc.)
  - Pleasure boats
  - Paved and unpaved roads (resuspended dust)
  - Ocean/bay salt (from salt water spray)
  - Off-road motor cycles
  - Domestic combustion-oil
  - Resource Recovery projects
  - Cogeneration
  - Gas Distribution (system leakage)
  - Biodegradation (at landfill sites)
  - Photoresist
  - Vegetation

Basic assumptions used in the current projection of the inventory are summarized in Tech. Memos 34 (Crouse, et al., 1981), 36 (Wada, et al., 1981), and 38 (Wada and Rothenberg, 1981), and include:

- Energy use and capacity (natural gas, petroleum, electricity).

- o Population growth as forecast in ABAG's Projections '79.
- o Employment growth and production at various industrial-commercial and manufacturing operations.
- o Allowance for future cogeneration/resource recovery projects (with combined emissions of 1.5 tons/day particulate, 3.3 tons/day organics, 15.1 tons/day NO_x, 2.6 tons/day SO_2, and 18.2 tons/day CO).
- o Control technology.
- o Effects of existing and future control regulations (i.e., BAAQMD Regulation 8, Rules 1-28).
- o Other - including engineering judgement on modifications to all of the above assumptions.

Energy assumptions generally dominate the other assumptions when calculating projections of mass emission rates from stationary sources.

Detailed documentation of the data and assumptions used to prepare the emission estimates for each source category is contained in the "Source Category Methodology" document prepared by BAAQMD (June 1982).

Motor Vehicle Emissions

The inventory of motor vehicle emissions is divided into two parts:

(i) link emissions - Occurring mainly on major streets and highways, these emissions are from vehicle engines that are fully warmed up (i.e., hot stabilized).

(ii) trip end emissions - These emissions occur at the beginning and end of each trip due to different engine operating characteristics. There are three types of trip end emissions: cold start, hot start and hot soak.

The methods and data used to compute link and trip end emissions are quite different, as are their resulting geographic and hourly distributions. These methods are fully documented in Tech. Memo 12 (Wada and Kan, 1977) for the 1979 Bay Area Air Quality Plan. For the 1982 Plan, a number of changes in methodology were adopted to reflect more recent developments. These are described in the following sections.

Regional Travel Forecasts -- Table 4 summarizes the current travel forecasts and presents, for comparison purposes, the corresponding outputs from the previous forecasts for the 1979 Plan. A comparison of this baseline with the earlier baseline shows that the current one is slightly lower. This is expected, however, since the current baseline incorporates the improvements in transit service that were adopted in the 1979 Plan.

TABLE 4. COMPARISON OF BASELINE TRAVEL FORECASTS

		Year	Vehicle Trips	VMT
1982 Plan		1979	9,987,800	77,300,000
		1987	11,251,400	90,400,000
1979 Plan	Baseline	1975	9,048,800	64,537,900
		1985	10,758,400	80,490,700
		2000	12,898,800	108,999,400
	Control Alt.	1985	10,482,800	78,456,100

Emission Factors. In the 1979 Plan the emission factors were based on ARB's EMFAC 3a, modified to account for EPA's Draft Supplement 8 to AP-42. For the 1982 update, the factors were based on EMFAC 6c (ARB, 1980 and 1981), and provided by ARB as before. To illustrate the difference in emission factors, Tables 5 and 6 are comparisons of the link and trip end factors, respectively, for both plans for the year 1975. EMFAC 6c reflects EPA's revised methodology for computing speed and temperature correction factors (USEPA, 1978). Emission factors are derived on the basis of the 1975 Federal Test Procedure, which assumes an ambient temperature of 75°F and an average route speed of 19.6 miles per hour. EMFAC 6c also reflects ARB estimates of vehicle use, age distribution, and vehicle deterioration rates. Speed and temperature correction factors are required in the inventory process to reflect local conditions as much as possible.

Separate trip end emissions inventories were developed for the ozone and carbon monoxide control strategy analyses to reflect the difference in temperature profile between a day in the worst ozone season and a day in the worst CO season. The emissions inventory for ozone was for a September weekday, while the inventory for carbon monoxide was for a November weekday, when ambient temperatures would be lower.

Vehicle Mix. The vehicle mix used in the 1979 Plan is compared in Table 7 with the current mix assumptions for the 1982 Plan. The 1979 Plan was based on statewide average vehicle travel as estimated in 1975, whereas the current mix assumptions are based on actual Bay Area truck counts conducted by Caltrans for MTC (Knudson, 1981). These counts revealed that the percentage of trucks actually on the road in the Bay Area is significantly lower than was assumed for the 1979 Plan.

A further refinement of the vehicle mix was the separate accounting for medium-duty trucks. For the 1979 Plan, medium-duty truck emission factors and estimates of the medium-duty truck population were not complete, so these vehicles were lumped with heavy-duty gasoline trucks. Since emission factors for medium-duty trucks can be significantly lower than those for heavy-duty trucks (see Table 8), the refined category

TABLE 6. 1975 LIGHT-DUTY VEHICLE TRIP END EMISSION FACTOR COMPARISONS (grams per trip)

	CO	HC (org.)	NOx
Cold Start			
1979 Plan	178.1	7.37	0.31
1982 Plan	158.0	12.19	3.48
Hot Start (catalyst only)			
1979 Plan	9.35	1.00	1.20
1982 Plan	13.52	3.72	4.50
Hot Soak			
1979 Plan	--	24.30	--
1982 Plan	--	11.18	--

TABLE 7. COMPARISON OF PERCENT CONTRIBUTION TO REGIONAL VEHICLE MILES OF TRAVEL BY VEHICLE CATEGORY

Vehicle Category	1979 Plan	1982 Plan
Light-duty auto	76.4%	81.8%
Medium-duty gasoline truck	--	1.4
Heavy-duty gasoline truck	7.6	1.1
Heavy-duty diesel	3.7	2.9
Light-duty truck and motorcycle	12.3	12.8

TABLE 8. 1979 TRUCK EMISSION FACTORS* (grams/mile)

	CO	HC	NOx	SOx	PART.
Heavy-Duty Gasoline	248.42	12.34	9.50	.36	1.24
Medium-Duty Gasoline	47.93	4.17	3.69	.13	.46

*100% hot stabilized emissions at 20 mph.

Bay Area Spatial Information System. Finally, the land cover distribution data were verified by comparison with aerial photography data and by on-site field work analyses of land uses of randomly selected test plots.

Emission Factors. Biogenic hydrocarbon emission factors, expressed as ug emission/m2 ground area-hr, were obtained for each of the twenty-three land cover classes by conducting a Delphi survey of scientists familiar with biogenic hydrocarbon emissions. The product of this survey was a set of total non-methane hydrocarbon (TNMHC) emission rates representative of daytime, summertime conditions. The emission rates varied with location in the Region, because the density of the vegetation population varies with location in the Region. Because biogenic hydrocarbon emission rates have been found to be different under day and night conditions, a set of nighttime emission factors, also varying with location in the Region, were developed from the Delphi results. All of these data are summarized in Tech. Memo 31 (Hunsaker, 1981).

Emission Intensity Map. Before the biogenic hydrocarbon emissions inventory was compiled, the vegetation file and emission factors were used to prepare Figure 7, which is a regional map of biogenic hydrocarbon emission intensities per unit area. The area-based daytime TNMHC biogenic emission factors assigned to the land cover classes were grouped into eight categories, each category representing one of the eight shade codes available on ABAG's computer program. Each category was assigned a shade code representative of emission intensity. The darkest shade was used for the highest emission rate per unit area, and the lightest shade was used for the lowest emission rate per unit area.

The map is useful in illustrating the geographical variation of relative biogenic hydrocarbon emission rates per unit area in the Region. For example, one point of interest is the large dark area in northern Sonoma County, where the land cover is primarily oak and coniferous forests. This particular section of the Region is expected to emit larger amounts of biogenic hydrocarbons than the lighter areas, such as the urbanized sections around the Bay. This map is useful in formulating a qualitative picture of biogenic hydrocarbon emission rates and in trying to understand their role in regional ozone production.

Results. Total nonmethane hydrocarbon biogenic emissions in the nine-county Bay Area for a twenty-four hour period of 12 hours of darkness and 12 hours of light were calculated to be 493 tons/day.

As shown in Figure 2, the air quality planning boundary of the BAAQMD defines a smaller region than the nine-county Bay Area. Therefore, the anthropogenic hydrocarbon inventory reported by the Bay Area Air Quality Management District represents a geographical region that is smaller than the nine-county Bay Area. The magnitude of the biogenic inventory cannot be compared directly with that of the anthropogenic inventory since the two inventories do not represent the same geographical area.

The uncertainty in the nine-county biogenic hydrocarbon emissions inventory has been calculated to be ± 50 percent. This uncertainty is based on the uncertainties in the area-based emission factors. The vegetation file also contributed to the total uncertainty of the

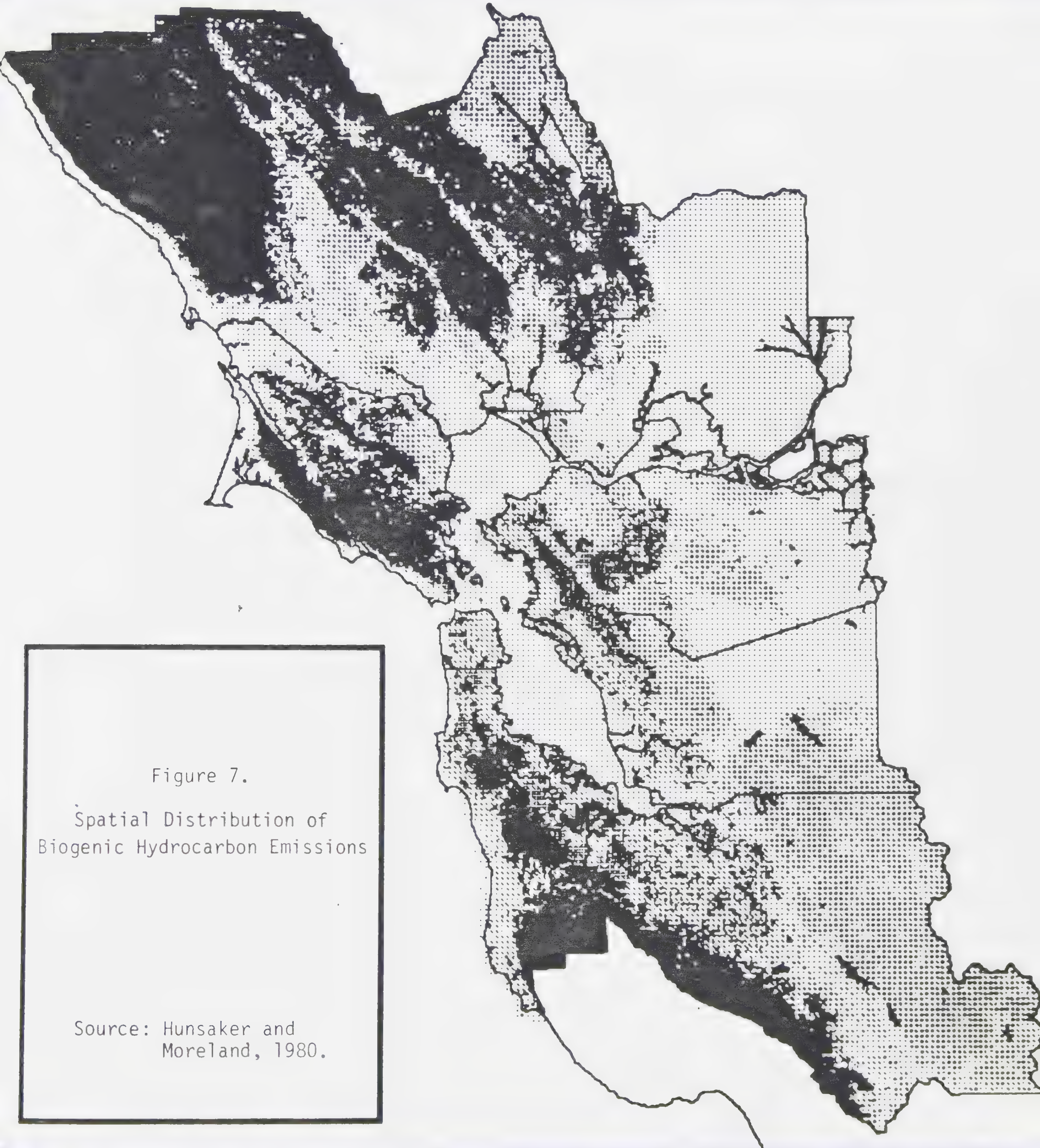


Figure 7.

Spatial Distribution of Biogenic Hydrocarbon Emissions

Source: Hunsaker and Moreland, 1980.

inventory. The value is unknown because the uncertainty in the file could not be translated into uncertainties in emission rates in a straightforward manner.

Emission Inventories Developed for the Livermore Regional Air Quality Model (LIRAQ)

Except for the biogenic emissions, the previously described emission inventory data represent annual averages of anthropogenic emissions. The LIRAQ simulations of air quality described in subsequent sections used inventories that were adjusted for seasonal and daily time variations, spatial variations, and photochemical reactivity of the emitted species. These adjustments are necessary to ensure that the conditions occurring on the prototype days are simulated as closely as possible. The seasonal effects are included in the source inventory versions titled "September Weekday" in Appendix E.

In 1979 the BAAQMD annual average inventory of reactive organic emissions was 732 tons/day, not including biogenic emissions. If biogenic emissions are included, the total becomes 1133 tons/day. For comparison, the LIRAQ-adjusted total of hydrocarbon species was 1393 tons/day. These adjustments can be significant for specific source categories which produce emissions at higher reactivity or at higher rates during the late summer/early autumn ozone season. The cost-effectiveness estimate of control measures was based on the time- and reactivity-weighted emissions which were used in LIRAQ modeling. Table 9 shows the LIRAQ equivalent emission reductions for control measures listed in Table 21 (Section IV), for a typical September weekday.

1979 AND 1987 BASELINE OZONE SIMULATIONS

The Livermore Regional Air Quality Model (LIRAQ)

Complex atmospheric and chemical relationships combine to determine air quality on an urban and regional basis. The use of sophisticated planning and analysis tools is necessary for developing information to guide in making decisions that will affect this air quality. The Livermore Regional Air Quality (LIRAQ) model, has been developed as an operational computer code to assist in tasks such as assessing the compliance of present air quality with Federal ambient air quality standards, evaluating the impact on regional air quality of various land use alternatives, and predicting the effect on regional air quality of new sources and various control strategies.

LIRAQ is a gridded, single-layer photochemical model that simulates in space and time changing concentrations of reactive and nonreactive pollutants. The model treats the Bay Area's complex topography and uses time-dependent fields of wind velocity, mixing depth and atmospheric transmissivity from specific days in the past. It also uses time-varying, gridded source emissions, including hydrocarbons specified in four reactivity categories. The model does not attempt to forecast tomorrow's air quality, because that would require the capability to forecast the regional meteorology, a formidable problem in itself. Instead, in LIRAQ, the meteorology must be specified, either at

TABLE 9. SEPTEMBER WEEKDAY ORGANIC EMISSION REDUCTIONS BY CONTROL MEASURE

	Control Measure	Hydrocarbon (tons/day)
1	ORG CHEM MFGR	.308
2	GEN SOLV & SURF COAT OPER	1.709
3	LETTER PRESS/OFFSET PRINT	3.794
4	NAT GAS & CRUDE OIL PROD	1.619
5	POLYMER & RESIN MFGR	.211
6	WOOD FURNITURE COATING	1.339
7	VOLATILE ORG WASTE DISP	7.367
8	CONSUMER SOLVENTS	2.962
9	MARINE LIGHTERING	.902
10	SHIP BARGE TANKER RR LOAD	3.494
11	GASOLINE DISTRIBUTION	1.000
12	ARCHITECTURAL COATINGS	1.094
13	VOC STORAGE	2.999
14	AUTOMOBILE REFINISHING	7.084
15	PESTICIDES	3.760
16	WINERIES	.797
17	COATINGS MANUFACTURING	.268
18	LAWNMOWERS	.160
19	RECIPROCATING ENGINES	5.430
22	VEGETABLE OIL MFGR	.561
23	AEROSPACE ASSBL & COATING	.609
24	RUBBER/PLASTIC PROD MFGR	1.351
25	PLEASURE BOATS	5.181
27	OFFROAD MOTORCYCLES	.688
28	INDUST MAINT COATING	1.362
29	SANITARY LANDFILL SITES	6.900
30	MARINE VESSEL GAS FREE	.150
32	SEMICONDUCTOR/PC MFG	7.538
33	COATING OF PLASTIC	2.442
35	NEW SOURCE REVIEW	.247
38	BAKERIES	1.661
41	NEW SERVICE STATIONS	.002
42	ZERO GAP SEALS FR TANKS	1.499

measurement stations or by coordinates. Typically, this involves use of meteorological situations that may be expected to be similar to future weather patterns (based on sets of previously acquired meteorological observations).

The LIRAQ model is particularly useful for evaluating control strategies because it treats regional fields of pollutant concentrations for prescribed source emissions and meteorology. For example, it can be used to determine the relative role played by various types of sources--mobile, point, airport, and area--in degrading regional air quality. Or, it might be used to investigate the relative importance of various species, as for example the importance of hydrocarbons with different reactivities. With such information, control strategies could be proposed and their effect simulated in order to determine the sense and magnitude of the effect.

Several major changes have been made in the formulation and inputs to LIRAQ since the modeling for the 1979 Plan. Each change has the potential to produce improvements in the model's performance:

a) The LIRAQ model chemistry was updated. The latest version, designated LIRAQ-4HC, treats aromatics separately as a new, fourth hydrocarbon class. In addition, inorganic rate constraints have been adjusted to conform to the most recent information available. Also, PAN and HNO_4 are now calculated explicitly and HNO_3, SO_2 and SO_4 have been dropped as reactive species.

b) Biogenic hydrocarbon emissions have been included in the gridded emissions inventory. The biogenic inventory was developed by using NASA satellite data to identify and classify vegetation types for 1 km x 1 km grid cells in the Bay Area. Emission factors were determined for each vegetation category, and from these the biogenic inventory was generated. Although the total regionwide biogenic hydrocarbon emissions are substantial, over 400 tons per day, they occur predominantly in areas well removed from the urban areas where most of the anthropogenic ozone precursors are emitted. Consequently, the impact of the biogenic inventory is far smaller than the 400 tons/day figure suggests.

c) A completely new emissions inventory has been developed for the 1979 base year. The new inventory reflects actual changes that have taken place since 1975, the base year used in the 1979 Bay Area Plan. The new inventory also reflects improvements that have been made in estimation methodology, more accurate emission factors, and the addition of several new categories that were not included in the previous base-year inventory.

d) The meteorological prototypical days were chosen to be representative of adverse conditions in the South Bay/Santa Clara Valley region where the Bay Area's worst ozone problems now occur. For the 1979 Plan, meteorology representing adverse conditions in the Livermore Valley was used because during the late 1960's and early 1970's the Livermore area experienced the Bay Area's highest ozone levels. During recent years Livermore

has experienced better air quality than the San Jose area (see Table 9 and the discussion of baseline air quality below).

e) Modifications were made in specifying some initial and boundary conditions. Initial and boundary conditions are often difficult to specify because of sparse or unrepresentative measurements. Because it was found that the hydrocarbon analyzers used by the BAAQMD typically "see" only about 55% of ambient NMHC, all measured 4:00 a.m. NMHC values were multiplied by 1.8 to give a more accurate estimate of the initial concentration field. Additional adjustments were made to NO_2 and NO measurements to correct for the fact that NO_2 data were about 14% high and NO measurements were on the order of 25% too low.

1979 Baseline Air Quality

The U.S. EPA Guidelines for Interpretation of Ozone Air Quality Standards define two statistical measures of air quality that determine the attainment status of air monitoring sites. The first, the "expected number of annual exceedances," is an estimate of the number of days per year on which the Federal 0.12 pphm standard is likely to be exceeded. The second, the "design value," is defined as that ozone concentration which is expected to be exceeded once per year at a given site. EPA specifies that both air quality measures should be based on the last three years of ozone data in order to reduce the effects of year-to-year meteorological variability.

The expected annual exceedances determine whether or not sites meet the Federal standard. A site is considered to have nonattainment status if its number of expected annual exceedances is greater than 1.0. Table 10 shows that as of 1979, 11 of 21 Bay Area ozone monitoring stations had achieved attainment status.

The design value is a measure of the amount by which the standard is exceeded. Thus, if a site's design value is 15 pphm, we know that worst-case ozone levels must be reduced by 3 pphm (or 20%) before the standard will be attained. Table 10 shows that as of the 1979 base year, Los Gatos had the Bay Area's highest design value of 19 pphm. The design value selection process is documented in Tech Memo 41 (Fong and DeMandel, 1982), and includes the highest recorded ozone values at each monitoring station. The LIRAQ modeling in this plan was used to predict the precursor emission reductions needed to reduce the ozone design value from 19 pphm in 1979 to 12 pphm in 1987.

Prototype Day Selection

One of the important inputs to the LIRAQ photochemical model is a description of meteorological conditions for the selected simulation day. The LIRAQ baseline simulation and future year simulations used the same meteorology. The selection of a prototype day having the appropriate meteorology was based on two considerations. First, for State Implementation Plan (SIP) purposes, the demonstration of attainment for 1987 must be based on worst case meteorology. Second, for verification purposes, the prototype day should be compatible with the baseline emission inventory.

In practice, worst case meteorology is defined to be that meteorology associated with the highest observed ozone concentrations. Accordingly, we reviewed historical ozone records to find those days with highest measured ozone concentrations. To account for multi-day stagnation episodes, where pollutants accumulate over time, a two-day modeling sequence was chosen. The advantage of a two-day simulation is that the initial conditions for the second day can be taken from the first day's simulation results.

The baseline emission inventory is representative of 1979 emissions, so we restricted the prototype days to those days in late 1978 through 1979. Also, because the emission inventory is representative of weekday emissions, only weekday high ozone days were considered.

Days meeting the above criteria were 28/29 September 1978 and 11/12 September 1979. Both the 29th and 12th have a one-hour maximum concentration of 19 pphm. AQMP Tech Memo 44 (Duker, 1982) discusses the meteorology on the prototype days.

<u>1979 Baseline Simulation</u>

The 1979 baseline simulation uses a 1979 emissions inventory and the meteorology of September 19, 1978. The two main purposes of this simulation are: 1) to assess model performance by comparing simulated concentrations with observations, and 2) to "calibrate" the model to account for imperfect verification.

Evaluation of the performance of grid-based photochemical models is a complex process; there are no simple rules for judging whether or not a particular simulation is acceptable for use in developing plans for attaining air quality standards. The success of baseline simulation is judged in terms of how closely the model duplicates observed concentrations during the simulation period. Important criteria are that the predicted maximum be reasonably close to the observed maximum and that simulated temporal and spatial variations are similar to observations, particularly in the vicinity of the highest observed values.

Table 11 compares the simulated and observed ozone concentrations at all Bay Area monitoring stations during the 14-hour simulation period. The simulated ozone values approximate the general behavior of observations in the following respects: 1) the observed and simulated maxima were about the same, 2) observed and simulated ozone concentrations were relatively high in the southeastern portion of the modeling region and relatively low in the western and northern portions (see Figure 8), and 3) generally, observed and simulated values increased until mid-afternoon and decreased thereafter.

Model performance for the 9/29/78 prototype day was evaluated using seven performance measures that have been applied to LIRAQ in the past (see AQMP Tech Memo 45 for details). These measures include:

- o the overall root-mean-square difference between all predicted and observed values, which is a measure of the overall agreement between predictions and observations;

TABLE 10. SUMMARY OF 1979 OZONE COMPLIANCE STATUS OF BAAQMD MONITORING SITES

Station	Estimated No. of O_3 12 pphm Days 1977	1978	1979	Expected Annual Exceedances* 1977-1979	Design Value** (pphm)
Santa Rosa	0.0	0.0	0.0	0.0	....
San Francisco	0.0	0.0	0.0	0.0	....
Oakland	0.0	0.0	0.0	0.0	....
Richmond	0.0	1.0	0.0	0.3	....
San Rafael	0.0	2.0	0.0	0.7	....
Redwood City	1.0	0.0	1.0	0.7	....
Fairfield	1.2	1.1	0.0	0.8	....
Mountain View	1.0	1.0	1.0	1.0	....
Napa	1.0	2.0	0.0	1.0	....
Vallejo	1.0	2.0	0.0	1.0	....
Sonoma	0.0	2.0	1.1	1.0	....
San Leandro	0.0	2.1	1.4	1.2	13
Gilroy	0.0	4.0	0.0	1.3	14
Pittsburg	0.0	6.0	1.0	2.3	15
Hayward	0.0	5.8	1.3	2.4	15
Livermore	3.0	2.1	3.0	2.7	15
Fremont	0.0	10.0	2.1	4.0	17
Concord	2.1	11.1	0.0	4.4	17
San Jose	3.0	12.2	4.0	6.4	16
Alum Rock	0.0	17.4	4.3	7.2	18
Los Gatos	3.1	22.8	9.7	11.9	19

*Running 3-year average of days with maximum hourly ozone concentrations exceeding 12 pphm. Measured number of days at a given site is adjusted for instrument downtime.

**The design value is defined as that concentration which is expected to be exceeded once per year. Design values are shown only for nonattainment sites, that is, locations with an expected annual exceedance greater than 1.0.

Table 11. Observed and LIRAQ-simulated hourly average ozone concentrations (in pphm) at 21 Bay Area monitoring stations. The simulation uses the 1979 emission inventory and the meteorology of 9/29/78.

STATION (MAP SYMBOL)		HOUR BEGINNING (PST) 04	05	06	07	08	09	10	11	12	13	14	15	16	17	MAX	MEAN	CORR. COEFF.
VALLEJO	OBS.	0	0	0	0	0	2	4	4	5	4	5	7	6	2	7	2.9	
(DVA)	SIM.	0	0	0	0	1	1	2	3	3	3	3	3	3	2	3	1.8	0.91
PITTSBURG	OBS.	0	0	0	0	3	2	2	6	8	9	8	7	6	8	9	4.3	
(DPT)	SIM.	0	0	0	0	1	1	2	3	3	4	5	5	4	4	5	2.3	0.95
CONCORD	OBS.	0	0	0	0	0	3	4	5	7	7	7	8	7	2	8	3.6	
(DCO)	SIM.	0	0	0	0	1	2	3	3	4	5	5	5	5	4	5	2.7	0.92
PLEASANT HILL	OBS.	0	0	0	0	0	3	3	4	6	8	8	7	7	5	8	3.7	
(DPH)	SIM.	0	0	0	0	1	2	3	3	4	5	5	5	5	4	5	2.7	0.98
LIVERMORE	OBS.	0	0	0	0	0	1	3	4	4	5	6	6	5	4	6	2.8	
(DLI)	SIM.	0	0	0	1	2	3	6	9	10	8	7	6	5	4	10	4.4	0.82
SAN RAFAEL	OBS.	1	1	1	1	1	2	3	5	8	8	9	9	8	2	9	4.2	
(DSR)	SIM.	0	0	0	0	1	2	4	4	5	5	5	5	5	4	5	2.9	0.88
RICHMOND	OBS.	1	0	0	1	1	2	3	5	7	8	9	7	2	1	9	3.4	
(DRM)	SIM.	0	0	0	1	1	2	3	4	4	4	4	4	4	3	4	2.4	0.80
SAN FRANCISCO	OBS.	1	1	1	0	1	1	3	4	7	3	1	1	0	0	7	1.8	
(DSF)	SIM.	0	0	0	0	0	1	1	3	4	6	7	7	5	4	7	2.7	0.20
S. F. POTRERO	OBS.	1	1	0	0	0	0	1	2	4	4	7	3	2	2	7	2.0	
(DFC)	SIM.	0	0	0	0	0	0	1	2	3	5	6	6	4	2	6	2.1	0.86
BURLINGAME	OBS.	0	0	0	0	1	1	2	3	4	10	14	5	2	1	14	3.1	
(DBU)	SIM.	0	0	0	0	1	1	3	5	6	7	8	8	6	3	8	3.3	0.79
REDWOOD CITY	OBS.	0	0	0	1	1	1	1	3	4	6	11	8	3	1	11	2.9	
(DRC)	SIM.	0	0	0	0	1	1	2	5	9	12	12	11	8	6	12	4.7	0.88
MOUNTAIN VIEW	OBS.	1	1	1	1	1	3	5	6	7	7	7	8	10	5	10	4.5	
(DMV)	SIM.	0	0	0	0	1	1	2	4	7	12	15	15	13	9	15	5.6	0.88
SARATOGA	OBS.	1	1	1	1	1	2	3	7	10	11	11	10	12	8	12	5.6	
(DSG)	SIM.	0	0	0	1	1	2	2	4	5	8	11	14	14	11	14	5.2	0.90
LOS GATOS	OBS.	2	1	1	1	1	3	8	12	15	19	18	15	12	7	19	8.2	
(DLG)	SIM.	0	0	0	1	1	1	2	4	6	8	10	12	14	13	14	5.2	0.73
OAKLAND	OBS.	1	1	1	1	1	1	2	4	6	7	5	2	1	1	7	2.4	
(OAK)	SIM.	0	0	0	0	0	1	2	3	5	6	6	5	4	3	6	2.5	0.71
SAN LEANDRO	OBS.	0	0	0	0	1	2	4	6	9	10	12	9	4	0	12	4.1	
(DSL)	SIM.	0	0	0	0	1	2	3	4	5	6	7	7	6	4	7	3.1	0.88
HAYWARD	OBS.	5	4	3	3	3	3	4	6	9	11	13	15	10	6	15	6.8	
(DHW)	SIM.	0	0	0	1	2	2	4	6	9	10	10	10	9	8	10	5.1	0.88
FREMONT	OBS.	1	1	1	1	2	2	5	9	12	11	13	17	9	5	17	6.4	
(DFR)	SIM.	0	0	0	1	2	3	5	7	10	13	14	14	13	10	14	6.5	0.93
EAST SAN JOSE	OBS.	0	0	0	0	1	2	6	10	10	10	14	10	16	10	16	6.4	
(DEJ)	SIM.	0	0	0	1	1	2	4	7	12	16	17	18	17	14	18	7.7	0.93
SAN JOSE	OBS.	1	1	1	1	1	3	7	8	10	9	13	11	12	8	13	6.1	
(DSJ)	SIM.	0	0	0	0	1	1	3	6	11	15	17	18	17	14	18	7.4	0.88
PACIFICA	OBS.	0	0	0	1	2	2	2	2	2	2	2	2	2	2	2	1.5	
(DPA)	SIM.	0	0	0	0	1	1	3	4	5	5	5	3	2	1	5	2.2	0.67
MAX	OBS.	5	4	3	3	3	5	8	12	15	19	18	17	16	10	19		
	SIM.	0	0	0	1	2	3	6	9	12	16	17	18	17	14	18		

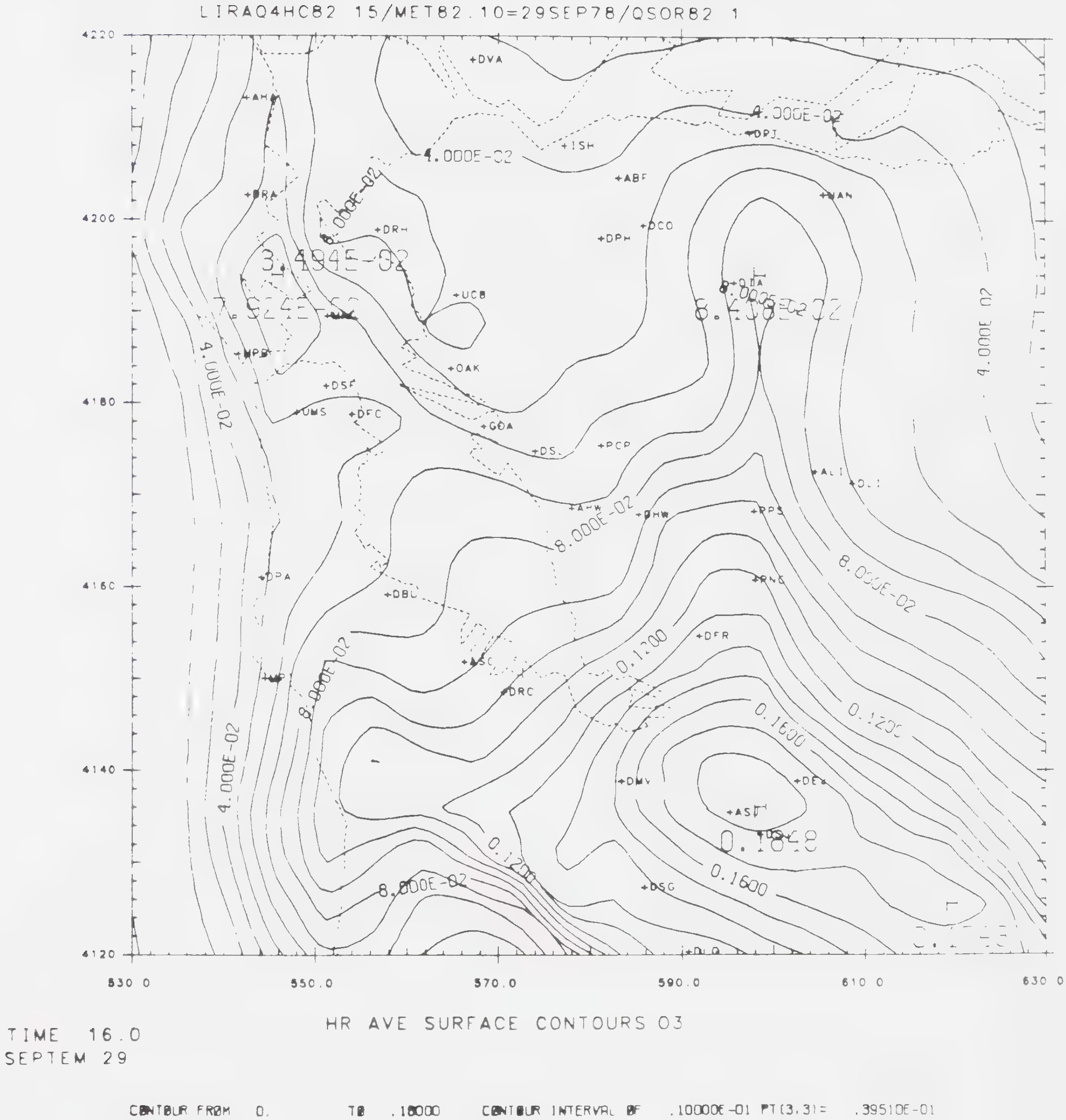


Figure 8. LIRAQ-Generated Mean Ozone Concentration from 3 p.m. to 4 p.m. PST. 1979 Base Year

- the overall correlation coefficients, which is a measure of combined spatial and temporal agreement;

- the ratio of peak values, which measures the model's ability to predict the highest concentrations; and

- the ratio of ensemble means of all predictions to all observations, which is a measure of overall system bias.

For five of the seven performance measures, the 9/29/78 simulation compares favorably with the simulation of 7/26/73 used in the 1979 Plan. Therefore the 9/29/78 simulation was judged to be acceptable for use the 1982 SIP update.

For the 1979 Plan a single ratio was used to correct for imperfect model performance. The predicted regionwide maximum was multiplied by the ratio of the measured regionwide maximum to the predicted maximum. This technique is easy to apply and relates directly to the worst-case concentrations of interest. However, the use of a single measurement and a simulated concentration at just one place and time is a very narrow measure of the relationship between predictions and observations.

Therefore it was decided that, for the 1982 SIP, a broader index of this relationship would be employed. The index that was selected was the mean ratio of predicted to observed concentrations for only those station-hours when a value of at least 12 pphm was observed. This ratio is a measure of the model's overall tendency to over- or under-predict for those places and times when high concentrations were observed. The mean ratio has the advantage that it specifically measures performance for adverse conditions, which are of primary interest in the air quality planning process. Also, because it is an average of several ratios, it is not greatly affected by an occasional inaccurate measurement. For the 1979 baseline simulation the mean ratio was 0.79. Thus, when concentrations were relatively high the model tended to underpredict, on the average, by about 20%. The underprediction for peak values was less, only about 6%.

1987 Future-Year Simulation and Projected Design Value

Using the Sept. 29, 1978 prototype day, LIRAQ was also run with the projected emissions inventory for 1987. The 1979 base-year and 1987 future-year results are presented in Figure 9 and Table 12. These simulations suggest that the regionwide maximum in the San Jose area will improve by nearly 30%. The predicted maxima are still slightly in excess of the 12 pphm standard.

The design value for 1987 was estimated by assuming that the 1979 design value, 19 pphm, would decrease in proportion to the decrease in simulated concentrations from 1979 to 1987. The design value is defined here as that concentration expected to be exceeded only once per year, so achieving a design value of 12 pphm would be equivalent to attaining the national ambient air quality standard of 12 pphm. Thus, if the LIRAQ-drived design value for the 1987 baseline inventory case was 12 or less, no additional controls would be required.

The LIRAQ results for 1987 simulations are interpreted through use of the same index described above, the mean ratio of predicted to

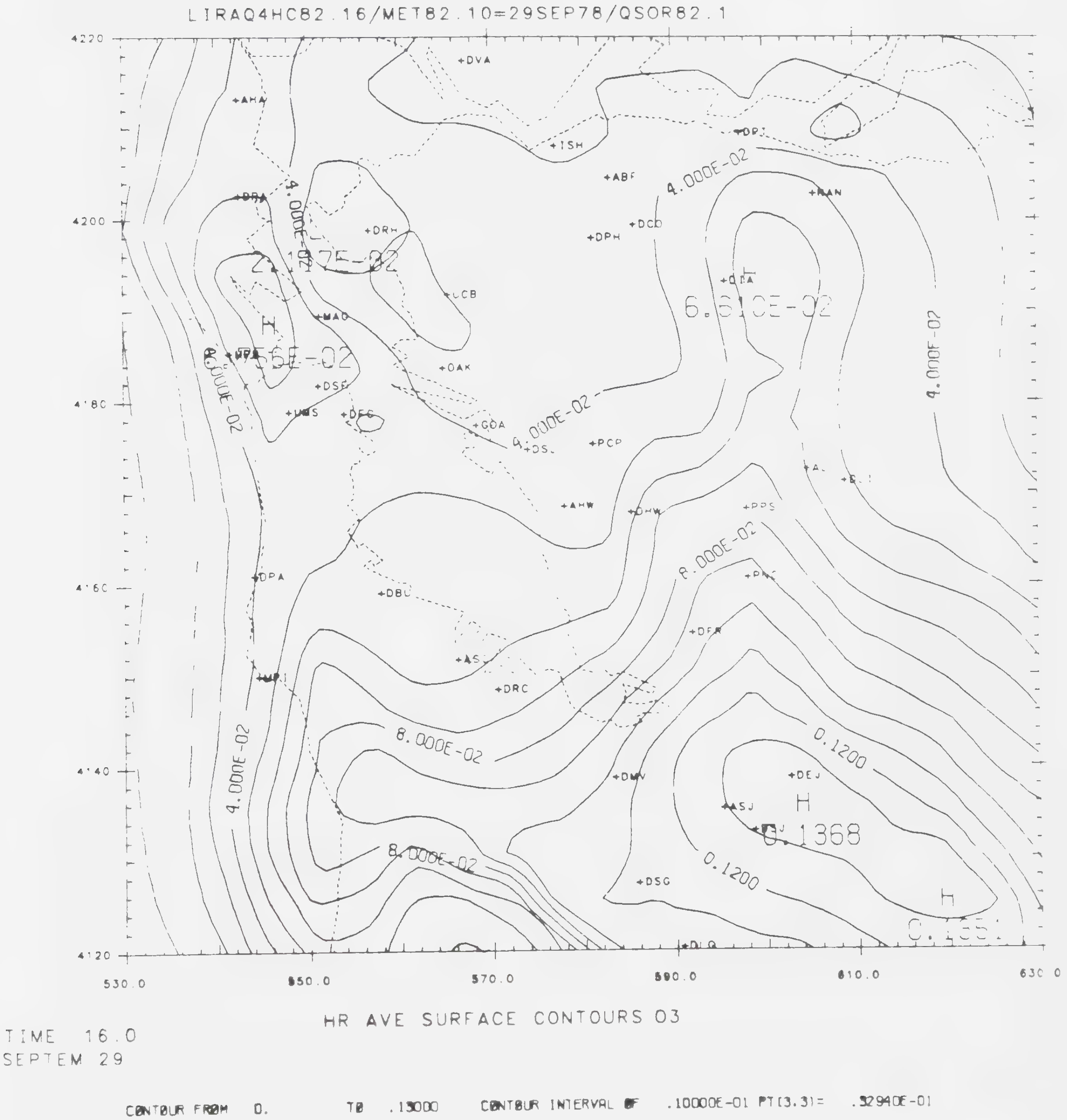


Figure 9. Projected 1987 Baseline Maximum Ozone Concentration Under Existing Programs Based on LIRAQ Tests.

TABLE 12. BASELINE LIRAQ SIMULATIONS USING THE SEPT. 29, 1978 PROTOTYPE METEOROLOGY TOGETHER WITH EMISSION INVENTORIES FROM THE 1979 BASE YEAR AND 1987 FUTURE YEAR.

Emissions Inventory Year:	1979	1987
Regionwide Maximum (pphm, simulated)	18.5	13.7
Station with highest simulated ozone	San Jose	East San Jose
Ozone concentration at highest station (pphm, simulated)	18.5	13.7
Simulated maximum 1-hour ozone at individual stations (pphm)		
Vallejo	3.4	2.9
Pittsburg	4.6	3.3
Concord	5.3	3.9
Pleasant Hill	5.3	3.9
Livermore	10.3	8.3
San Rafael	5.2	4.7
Richmond	4.1	3.0
San Francisco	6.8	5.6
S.F. Potrero	5.6	4.6
Burlingame	7.6	5.5
Redwood City	12.1	8.5
Mountain View	15.1	10.9
Saratoga	14.0	11.0
Los Gatos	13.8	11.1
Oakland	6.0	4.1
San Leandro	6.7	4.3
Hayward	10.1	7.1
Fremont	14.2	10.3
East San Jose	18.0	13.7
San Jose	18.5	13.4
Pacifica	5.3	4.1
Mean ratio of predictions to observations*	0.829	0.630
Design Value (pphm)	19	14.4**

*For only those station-hours when the observed concentration was at least 12 pphm.

**The projected 1987 design value was obtained by multiplying the 1979 base-year design value by 0.630/0.829.

observed concentrations for observations greater than or equal to 12 pphm. The change in the mean observation/prediction ratio from 1979 to 1987 is a measure of the change in concentrations under adverse conditions. Thus, the projected 1987 design value was calculated to be 19 pphm x 0.630/0.829, or 14.4 pphm (see Table 12).

LIRAQ OZONE SENSITIVITY ANALYSIS

This section summarizes the results of a LIRAQ* sensitivity analysis. The analysis used data derived from two sources: 1) a set of 42 LIRAQ simulations, some verifying the model to the 1979 baseline prototype days and others making preliminary projections to 1987 of ozone levels for baseline and control strategy scenarios, and 2) trajectory model simulations of the full LIRAQ model needed because some sensitivity information was not available from the set of full model simulations. Sensitivity information derived from the trajectory simulations correlated reasonably well with ones derived from the full LIRAQ simulations.

The "sensitivity coefficient" is the measure of sensitivity used here. It is defined to be the ratio of the percentage change in the ozone measure (the ozone measure is the average ratio of predicted ozone over observed, for observed ozone greater than or equal to 12 pphm) over the percentage change in an input parameter. For example, if the ozone measure increased by 5 percent for 10 percent decrease in NO_x emissions, the sensitivity coefficient for NO_x emissions would be -.50.

Sensitivity to Initial Conditions. The initial condition fields are derived from BAAQMD pollutant observations for the start time of the prototype day simulated. The model uses an objective analysis algorithm to assign concentrations to all model grid cells from these few observations. The total mass in the model volume for the primary species can be computed for each simulation and is used as the initial condition parameter.

Multiple regression was performed on full simulations in which the variation in parameters was restricted to initial condition changes. The initial conditions of nitric oxide, nitrogen dioxide, and total speciated hydrocarbons were used as independent variables for this regression. The resulting sensitivity coefficients are listed in Table 13.

Sensitivity to Boundary Conditions. Only three tests were made of the effects of changing the boundary conditions. All three used different versions of the meteorology for the September 29 prototype day. The test which used the most current meteorology of the three varied all the boundary conditions. However, the trajectory model sensitivity tests indicate that the model is ten to one hundred times more sensitive to the top ozone boundary condition than to any other. Hence, in the above mentioned test, the variation in ozone appears mainly attributable to the change in top ozone boundary value. The resulting sensitivity coefficients are listed in Table 13.

*The version of LIRAQ used for this analysis was described previously, and is also known as LIRAQ4HC.

Sensitivity to Emissions. Sensitivity tests which varied only emission inputs were not done using the full LIRAQ model, except for the 1979 baseline simulations which differed only in the exclusion or inclusion of biogenic emissions (discussed below). However, a multiple regression was performed on all the data after the effects of initial conditions were removed where NO_x and total hydrocarbon emissions within the LIRAQ model were the independent variables. The resulting sensitivity coefficients are listed in Table 13.

Sensitivity to Hydrocarbon Species. The data from the set of full model simulations was insufficient to allow the determination of LIRAQ sensitivity to its individual hydrocarbon components: alkenes, alkanes, aromatics, and aldehydes. This information was obtained through trajectory model simulations for the September 12 and 29 prototype days on three different trajectories: San Francisco to San Jose, Richmond to San Jose, and Oakland to San Jose. The resulting sensitivity coefficients are listed in Table 13.

TABLE 13. SENSITIVITY COEFFICIENTS*

Parameter	Full Model		Trajectory Model	
	range	mean	range	mean
initial conditions				
nitric oxide		-.13	(-.19,-.61)	-.38
nitrogen dioxide		-.28	(-.11,-.25)	-.19
total hydrocarbons		.82	(.40,1.3)	.91
boundary conditions				
ozone	(.09,.34)	.23	(.03,.41)	.20
emissions				
total hydrocarbons		.88	(.48,1.4)	1.0
NO_x		-1.5	(-.79,-1.8)	-1.4
alkenes			(.30,.73)	.57
alkanes			(.06,.26)	.15
aromatics			(.09,.50)	.25
aldehydes			(.04,.14)	.08

* - Sensitivity coefficient is defined to be the ratio of the percentage change in the ozone measure due to a change in parameter divided by the percentage change in the parameter.

The LIRAQ model seems to be most sensitive to NO_x emissions, total hydrocarbon emissions, and total hydrocarbon initial conditions with absolute sensitivity coefficients about one. Note that the sensitivity to NO_x is negative, so reductions of NO_x emissions will increase ozone production. This implies that within the LIRAQ modeling domain the ozone control program will not benefit from NO_x reductions.

The other parameters, initial condition of nitric oxide, initial condition of nitrogen dioxide, and the ozone boundary condition, are of secondary effectiveness with absolute sensitivity coefficients about .3.

The model shows large variability in sensitivity among the component hydrocarbon emissions with about a factor of two difference in sensitivity between any two adjacent coefficients. The sensitivities of the model to the component hydrocarbon emissions in decreasing order are alkenes, aromatics, alkanes, and aldehydes. Hence, control programs which emphasize control of hydrocarbon species in the above order would be more effective per ton reduction than control programs which did not.

Influence of Biogenic Emissions. Four simulations were done without biogenic emissions in the emission inventory. Two early versions of a 1979 baseline emissions inventory were used, as were inventories for a 1987 baseline emissions estimate and a 1987 control strategy. Table 14 gives a pairwise comparison between the simulations with and without biogenic emissions.

TABLE 14. COMPARISON OF SIMULATIONS WITH AND WITHOUT BIOGENIC EMISSIONS

Description	Ozone Measure With Biogenics	Ozone Measure Without Biogenics	Percent Change	Percent Change in Regional HC Inventory
1979 baseline	.783	.652	-17	-31
1979 baseline	.706	.592	-16	-31
1987 baseline	.547	.405	-26	-39
1987 control	.477	.293	-39	-42

All four simulations without biogenic emissions resulted in lower ozone than their biogenic counterparts, with a range of 16 to 39 percent reduction. The percent change depends on the relative size of the non-biogenic portion of the inventory.

In order to show the influence of biogenic emissions upon the LIRAQ model the fractions of hydrocarbon emissions contributed by biogenic sources are presented in Table 15.

TABLE 15. FRACTIONAL CONTRIBUTION OF BIOGENIC EMISSIONS TO HYDROCARBON INVENTORY

Inventory	Emission Component: Alkenes	Alkanes	Aromatics	Aldehydes	Total Hydrocarbons
Regional					
1979 Baseline	.74	.12	.25	0	.31
1987 Baseline	.80	.16	.32	0	.39
Modeling Domain*					
1979 Baseline	.40	.05	.12	0	.12
1987 Baseline	.50	.06	.16	0	.16

*The 100 km x 100 km area used by the LIRAQ model.

The biogenic sources contribute a substantial fraction of the alkene emissions, which is the hydrocarbon component to which the model seems to be the most sensitive. The predicted changes in the ozone level by the sensitivity coefficients are larger than the changes shown in Table 13. This discrepancy may be attributable to the spatial distribution of the biogenic emissions which are higher in outlying areas and lower in populated areas, thereby lowering their influence upon the ozone measure.

Stationary versus Mobile Control. The difference in effectiveness between mobile and stationary source hydrocarbon controls was examined with two different control scenarios. In one case a 43 tons/day reduction due to inspection and maintenance was simulated, and in the other case a 58 ton/day stationary source reduction was simulated. These reductions are annual average BAAQMD values. The results are tabulated in Table 16.

TABLE 16. COMPARISON OF THE EFFECTS OF MOBILE AND STATIONARY EMISSION REDUCTIONS ON OZONE

Simulation	Model HC Emissions (tons/day)*	Ozone Measure	Sens. Coeff. to HC emissions	Effectiveness (% change/ton)**
1987 baseline	677	.547		
mobile control	632	.525	.60	-.094
stationary control	615	.529	.36	-.057

* - The tons unit represent speciated hydrocarbon emissions within LIRAQ model domain. This is a 100 kilometer by 100 kilometer area covering most of the populated areas within the Bay Area.

** - The ton unit represent regional BAAQMD annual average emission tonnages.

In this comparison the model is more sensitive to mobile source emission changes than to stationary source emission changes, which is an indication that the hydrocarbon mix from mobile sources is much more ozone-productive than the mix from stationary sources. The effectiveness with respect to BAAQMD annual average emission tonnage is also computed. The result is that mobile source controls are about 60 percent more effective per ton than the average stationary source control.

Implications for Control Programs. The relatively large negative sensitivity coefficient for the NO_x indicates that reducing NO_x emissions will increase ozone, so the ozone control program for 1987 will not benefit from a NO_x emissions control strategy. In fact, NOx reductions would probably be detrimental within the LIRAQ modeling area.

The sensitivity coefficients for the component hydrocarbons, alkenes and aromatics, are significantly larger than for either alkanes or aldehydes. Control programs will be more effective per ton if they focus on controlling these two hydrocarbon species.

Mobile source hydrocarbon control is about 60 percent more effective per ton than the average stationary source control because of its hydrocarbon mix. However, programs that reduce mobile source hydrocarbon and NO_x emissions simultaneously (e.g., reductions in vehicle-miles-traveled) will likely have little or no impact on reducing ambient ozone levels.

<u>Hydrocarbon Emission Reduction Target</u>

This section describes the method for determining the hydrocarbon emission reduction target.

A three-step process is applied to predict 1987 design values for ozone with the LIRAQ model:

(1) establish a 1979 baseline simulated ozone level;

(2) simulate 1987 ozone levels using projected 1987 inventories for baseline and control strategy scenarios; and

(3) compute the 1987 ozone design values for the different scenarios by multiplying the current design value with the ratios of different 1987 simulated scenario ozone levels to the 1979 baseline simulated ozone level.

The current design value is .193 ppm ozone and the attainment level is .12 ppm. Hence, the ratio for attainment is .120/.193 = .622. Since every 1987 baseline simulation yielded a ratio above this value, the problem becomes one of determining the amount of additional emission reductions needed to reach attainment. The emission reductions are only for hydrocarbons since it has been established through the sensitivity analysis that NO_x emission reductions will increase regional ozone production (this is consistent with results of the 1979 Plan).

The planning process unavoidably required that a number of 1979 baseline, 1987 baseline, and 1987 control strategy simulation sequences be performed (each sequence differed slightly in the 1979 baseline emission inventory). The ratio of ozone levels has been plotted against the ratio of total regional speciated hydrocarbon emissions for these sequences, as shown in Figure 10. All ratios were formed as 1987 values over 1979 baseline values. A second order polynomial was fitted to the data and this graph intersected the attainment level ratio of .622 at a total hydrocarbon fraction of .694 $\pm$ .013. This average result assumes that all sequences are considered equal, i.e., the variation in the 1979 baseline inventory is due to uncertainty in emission estimates. It serves as a first estimate of the attainment emissions level.

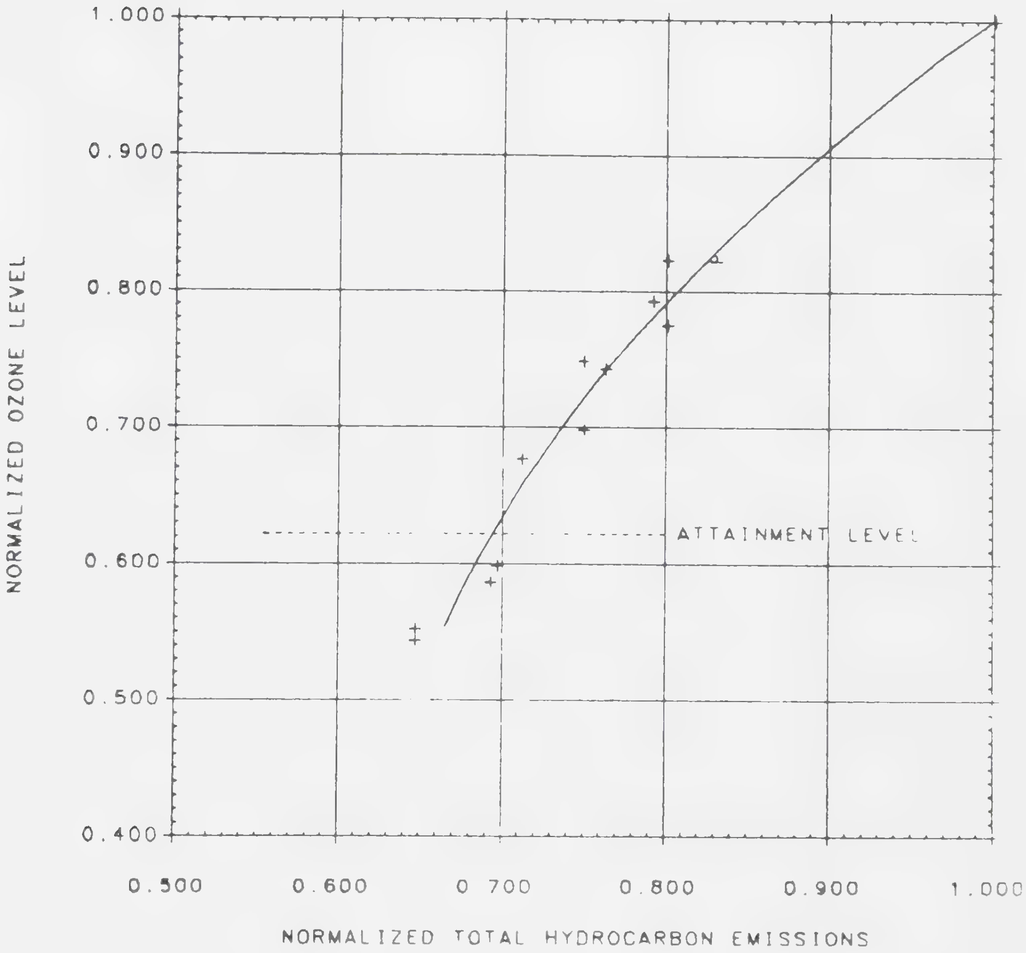


Figure 10. Ozone Level Versus Total Hydrocarbons Normalized to 1979 Baseline

(Normalized values formed by division of predicted ozone levels and hydrocarbon emissions by their respective 1979 baseline values)

The 1979 baseline LIRAQ emission inventory contained a total of 1393 tons per day of speciated hydrocarbons, and so the estimated hydrocarbon emission level for attainment is 967 ± 18 tons per day. The 1987 baseline emission inventory contained 1091 tons per day of speciated hydrocarbons. Hence, the additional reduction necessary to reach attainment is 124 tons per day. The corresponding reduction in terms of annual average BAAQMD hydrocarbon emissions is approximately 85 tons per day, for the group of control measures being considered. (The measures recommended in Section IV have higher reactivity and/or higher temporal weighting factors for September weekday emissions. The nominal emission reduction of 85 tons/day is thus "amplified" to about 125 tons/day in terms of efficiency in reducing ozone.)

PRESENT AND PROJECTED CO PROBLEMS

In the 1979 Plan, future carbon monoxide concentration levels were predicted by performing linear rollback, based on existing ambient carbon monoxide monitoring data and on estimates of regional emissions. The problems with this approach were twofold. First, it was not known whether the existing monitoring stations were sited in worst case locations; second, emissions everywhere in the region would have to be reduced to a level specified by the rollback calculation. Since the calculation was based on a measurement taken at one location, it failed to take into account the localized and potentially diverse nature of carbon monoxide problems. High concentrations of carbon monoxide typically occur in areas with high traffic densities.

Following the 1979 Plan recommendations, a series of special monitoring programs were implemented in the winter seasons between 1979 and 1982 for the purpose of identifying localized problem areas, or "hot spots." Hot spot data from the 1979-80, 1980-81 and 1981-82 monitoring programs indicated exceedances of the eight-hour CO standard (10 mg/m^3) in San Jose, Oakland, San Francisco, Campbell, Palo Alto and Santa Clara, as shown in Table 17. No exceedances of the one-hour standard (40 mg/m^3) were measured in any of the hot spot monitoring programs. Permanent station monitoring also measured high CO in Vallejo, where the maximum eight-hour average in the period 1978-1980 was 15 mg/m^3.

TABLE 17 BAY AREA CO HOT SPOT MONITORING DATA

City	Site	Number of Exceedances	Monitoring Program	Maximum Eight Hour Average (mg/m^3)
San Jose	First Street	20	1979-80	20.6 (18 ppm)
	San Jose State University	1	1981-82	11.7
	Spartan Field	2	1981-82	15.8
Oakland	Broadway	21	1979-80	16
San Francisco	Geary Street	2	1980-81	13.2
	Battery Street	1	1979-80	11.5
Campbell	South Bascom	3	1980-81	10.9
Palo Alto	El Camino Real	12	1980-81	12.7
Santa Clara	Hayward Drive	10	1981-82	13.1

The 1982 Plan focuses on three locations where the highest eight-hour CO values were measured: San Jose, Oakland and Vallejo. Since the maximum CO concentrations measured in the remaining locations are relatively close to the standard, mobile source emission reductions as a result of the Federal and state vehicle emission programs should be sufficient to achieve the Federal eight-hour standard by 1987.

Figure 11 shows the location of these areas with respect to the entire region. Figures 12 and 13 show the hot spot sites in San Jose and Oakland. The BAAQMD permanent monitoring site in Vallejo was considered to be sited in a hot spot, so no additional monitoring was conducted there. The monitoring data also yielded the following conclusions:

- o A high level of ambient carbon monoxide builds up over the densely urbanized portions of the Santa Clara Valley on cold, meteorologically stagnant winter evenings.

- o Due to differences in meteorological conditions, other parts of the region with comparable levels of traffic congestion do not experience CO problems as severe as those in San Jose.

- o The CO problem in the Santa Clara Valley is not isolated to a few hot spots but appears to be spread over a large portion of the urban area.

Carbon Monoxide Modeling Approach

There are problems with applying both the modified linear rollback and dispersion modeling techniques to the study of CO problems at urban intersections. Neither approach is able to accurately simulate the complex wind flows and eddies that exist within a street canyon. A reasonably accurate dispersion modeling effort would have required extensive meteorological and monitoring input data, which was beyond the scope and timeframe of the plan. The collection of hot spot data, on the other hand, made possible the determination of baseline concentrations and emissions levels. This determination enabled a reasonably good application of the linear rollback approach to forecast future carbon monoxide levels in San Jose and in Oakland. The rollback approach was judged adequate for Vallejo in view of the fact that the City's design value was so close to the standard.

The linear rollback model assumes that ambient concentrations are directly proportional to emissions without explicit examination of dispersion patterns. Dispersion models incorporate meteorological and topographical factors. Instead of being applied regionally, linear rollback was applied to a local emissions inventory developed for specific locations where a carbon monoxide problem has been identified. Since the standard is usually exceeded in areas with significant levels of traffic congestion, the focus of carbon monoxide analyses is usually on intersections in urban settings.

Figure 11.

Bay Area Carbon Monoxide (CO) Hot Spot Locations

SAN FRANCISCO BAY REGION

ASSOCIATION OF BAY AREA GOVERNMENTS,1978

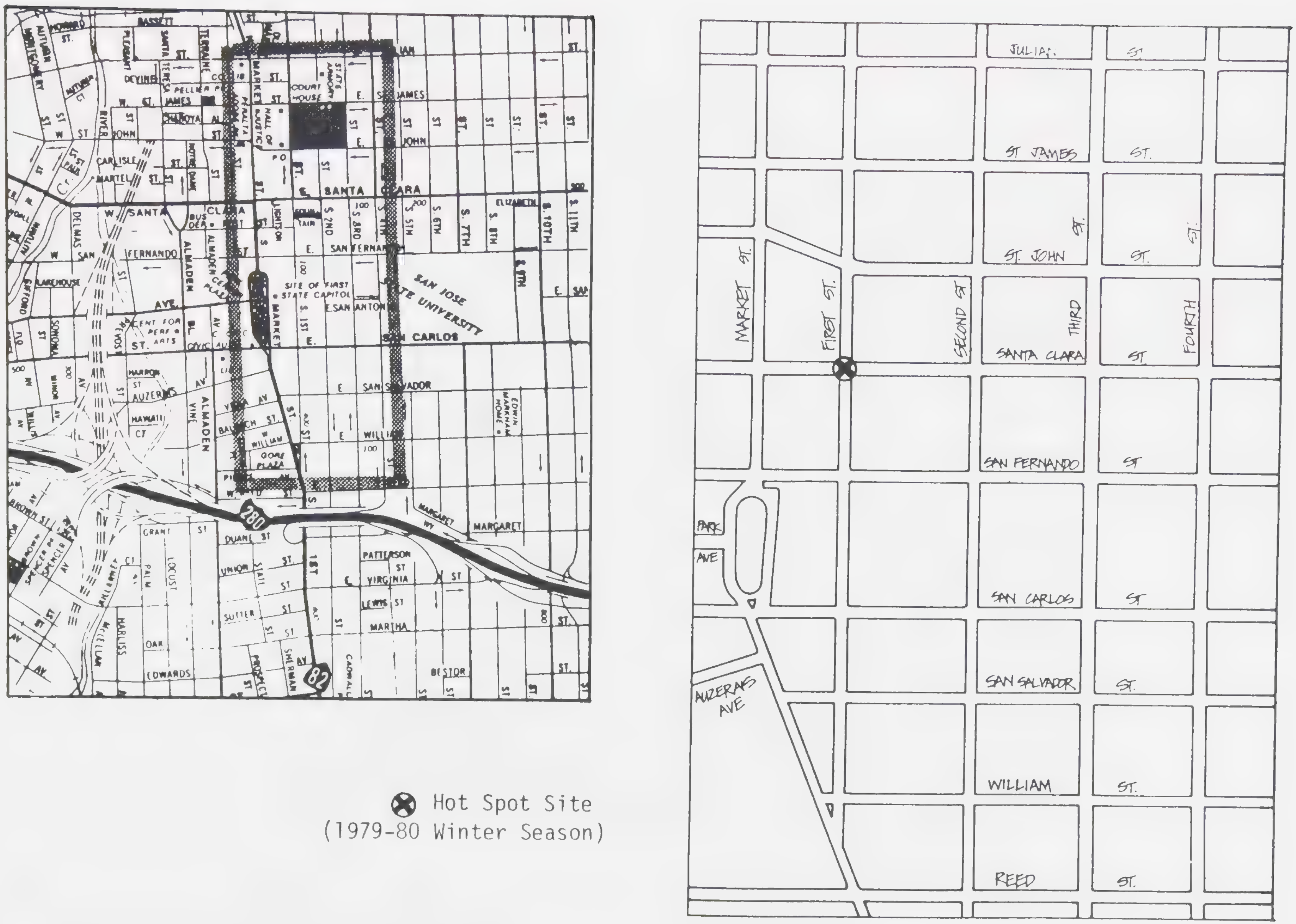


Figure 12. San Jose Study Area and Monitoring Site

Figure 13. Oakland Monitoring Site

The carbon monoxide concentration level at an intersection was divided into two parts:

(1) a local concentration directly attributable to vehicles at the intersection; and

(2) a background concentration attributable to areawide diffusion of carbon monoxide emissions from all vehicle sources.

This can be represented as follows:

$$C_t = C_o + C_b \tag{1}$$

where C_t = the total concentration

C_o = the local concentration

C_b = the background concentration

CO concentrations in an urban area can be viewed as consisting of an urban background level with microscale peaks superimposed. (See Figure 14.) The local concentration is directly proportional to intersection traffic volumes and vehicle emission rates. The background concentration is a function of areawide traffic volumes and vehicle emission rates.

The modeling approach was to treat the local and background components separately. That is, rollback was applied to the local and areawide emissions inventories separately, to determine the local and background concentrations, respectively. The relationship between emissions and concentrations is shown in Equation (2) below:

$$C_t = \overbrace{K_1 E_{Local}}^{C_o} + \overbrace{K_2 E_{Area}}^{C_b} \tag{2}$$

where C_t = the total concentration

C_o = the local concentration

C_b = the background concentration

E_{Local} = the local (intersection) emissions inventory

E_{Area} = the area emissions inventory

K_1, K_2 = meteorological factors

Separate rollback models were developed for San Jose, Oakland and Vallejo. For San Jose and Oakland, ambient CO data collected from the 1979-1980 hot spot monitoring program was the basis for model development and verification. In Vallejo, where no hot spot monitoring was performed, rollback was applied to an emissions inventory for the entire city.

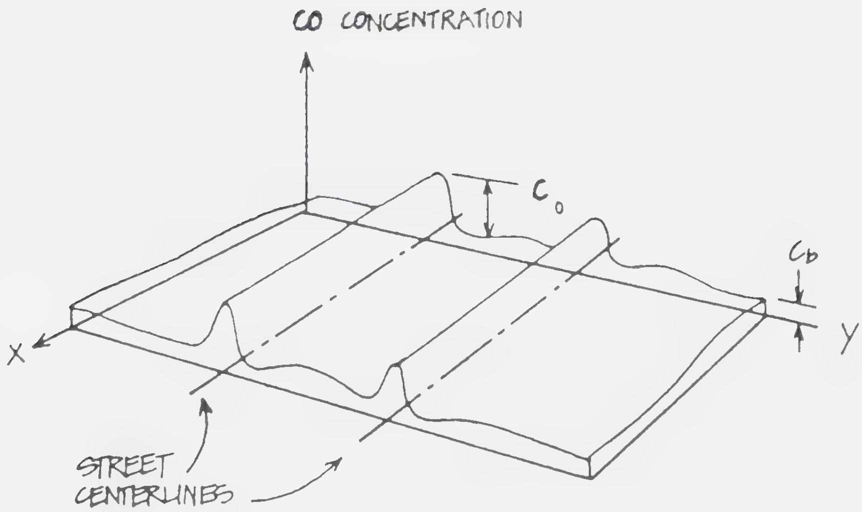


Figure 14. Spatial Variation of Carbon Monoxide in an Urban Setting

There are three critical issues in the application of the model for control strategy assessment: the contribution of background to ambient concentrations, the areawide emissions inventories and the local (intersection) emissions inventories.

The regional carbon monoxide design values, defined to be the maximum of all second highest values for each year in the period 1978-80 for all Bay Area stations, is not required in the CO modeling approach. Instead, the hot spot monitoring data provide reference concentration values against which rollback is applied to produce baseline 1987 CO concentrations.

The reference concentration values for San Jose and Oakland are derived in the same manner the regional design value is derived, except they are based in hot spot data only. The Vallejo reference concentration value is based on three successive years (1978-80) of permanent monitoring station data. The reference values are 17 mg/m^3 for San Jose, 16 mg/m^3 for Oakland and 12 mg/m^3 Vallejo.

Carbon Monoxide Background Concentrations. Conventional hot spot analyses assume that carbon monoxide concentrations are dominated by local (intersection) vehicular emissions rather than areawide emissions. This may be true in the case of the one-hour averaging time, but for the eight-hour average, neither local nor areawide emissions can be expected to be consistently dominant.

In San Jose, where the most intensive hot spot monitoring programs have been performed, it was found that under neutral or unstable atmospheric conditions (such as on clear days or windy conditions), CO concentrations were indeed higher at the monitored hot spot than at the permanent station located several blocks away. This is consistent with the conventional wisdom that carbon monoxide concentrations are localized. However, during very stable, calm winter evenings, when the standards are most likely to be exceeded, hot spot and station concentrations were found to be comparably high. A review of all available San Jose area monitoring data confirmed this pattern. Thus, under adverse meteorological conditions, during short winter days, when evening commuter traffic extends into the hours of darkness and in an extensively urbanized area with a well developed highway and street network, a uniform cloud of carbon monoxide can be expected to develop, extending from several city blocks to several kilometers.

In San Jose the background concentration is estimated to be 75% of the ambient concentration under adverse meteorological conditions. In Oakland, the background concentration is estimated to be 50%. The Oakland estimate is based on: (1) the existence of greater horizontal and vertical mixing effects due to winds from the Bay, and (2) the lower probability that an air parcel reaching the downtown area would have traveled over and collected emissions from a high-emission urban area in the previous hours. In Vallejo, where no data on background are available, a 50% background contribution is also assumed.

Areawide Emissions Inventory. The areawide emissions inventory was derived from the LIRAQ inventory of mobile source emissions, which is based upon regional estimates of vehicle miles of travel and trips. The areawide inventory was calculated for a subset of the region, approximately 25 square kilometers in size centering on the monitoring site. The inventory was developed for a typical November day, when exceedances of the carbon monoxide standard are most likely to occur.

Local Emissions Inventory. The local emissions inventory takes into account traffic conditions at intersections, which are not accounted for in the regional forecasts of vehicular travel. Two types of emissions are considered in developing the local (intersection) emissions inventory:

- o free-flow emissions - produced by a vehicle traveling at a relatively constant rate, without interruption;

- o excess emissions - produced by a delayed vehicle in the acceleration, deceleration and idling modes. These emissions are over and above those which would have occurred had the vehicle not stopped.

Since carbon monoxide emission rates increase with decreasing speeds, a significant portion of total emissions at a signalized intersection can be due to excess emissions. Traffic information on volumes, capacities, speeds, turning movements and traffic signal patterns, were used to estimate queue lengths and delay times which determine the amount of excess emissions produced at an intersection. Emission factors are influenced by vehicle mix, average speed, temperature and vehicle operating mode (idling, acceleration, deceleration, cruising).

Baseline 1987 Carbon Monoxide Forecast

Based on the carbon monoxide modeling approach described above, forecasts of baseline 1987 carbon monoxide concentrations were made for San Jose, Oakland, and Vallejo, as shown in Table 18. In the case of San Jose, the study area was expanded from the hot spot site to a 45-block area in downtown San Jose in order to take into account: (1) the high urban background level, and (2) the large projected increase in traffic as a result of downtown redevelopment. Carbon monoxide concentrations for the major intersections in this area are shown in Figure 15. In Vallejo, where no hot spot monitoring was performed, the ambient concentration was projected for a 25-square kilometer area centered around the permanent monitoring site.

TABLE 18. BASELINE 1987 CARBON MONOXIDE CONCENTRATIONS FOR SAN JOSE, OAKLAND AND VALLEJO (mg/m^3)

	San Jose	Oakland	Vallejo
1979 Reference Value	17.	16.	12.
1987 Forecast	12.2	9.3	7.3

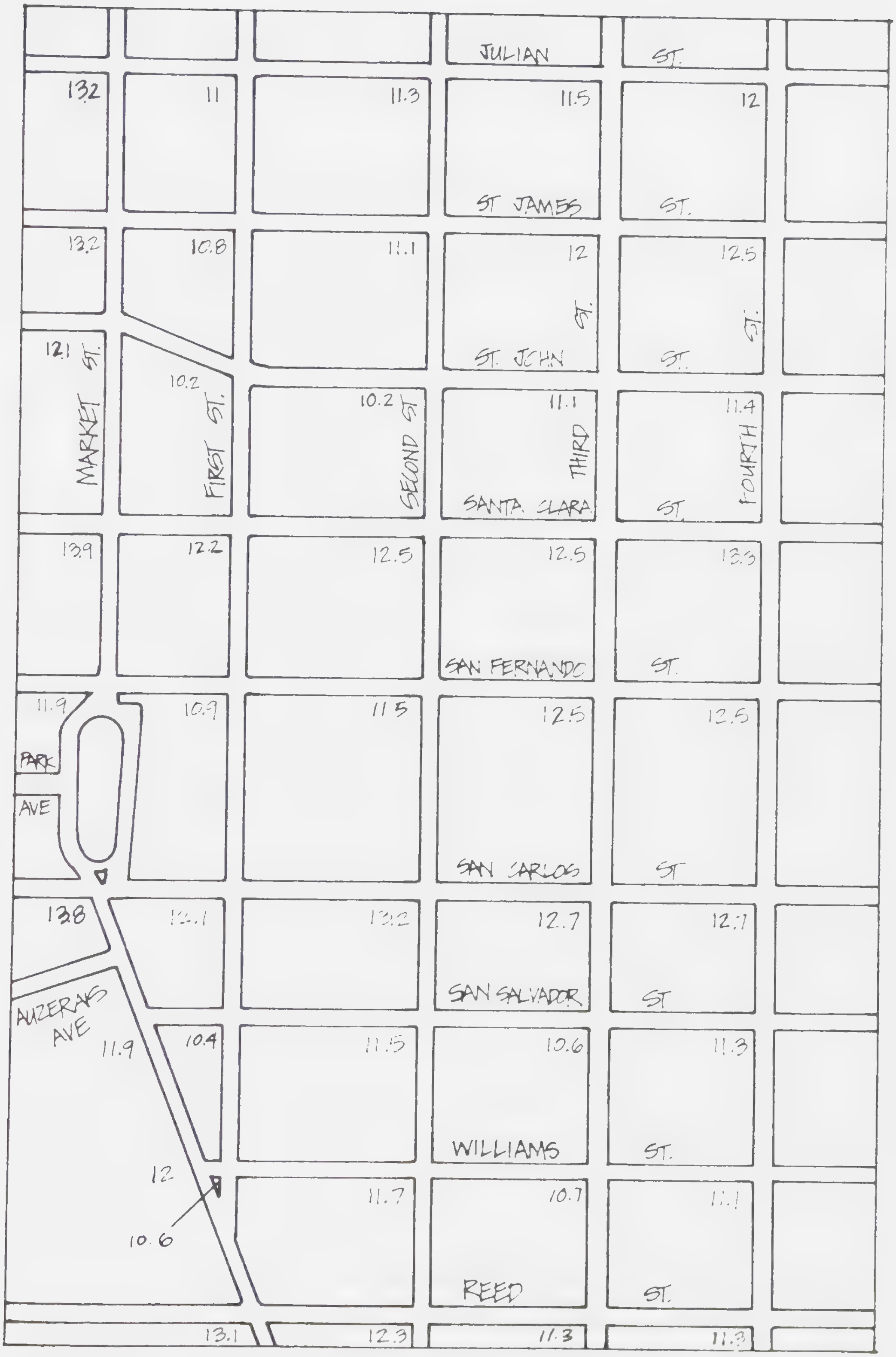


Figure 15. 1987 Baseline CO Concentrations in Downtown San Jose mg/m³

The projections show that carbon monoxide levels are expected to decrease by 1987. This improvement is due to the existing Federal and California motor vehicle control programs. In San Jose, however, the trend toward cleaner cars is not sufficient to counter the increase in emissions due to growth in traffic. The 1987 concentration at the hot spot site (First and Santa Clara) is 12.2 mg/m^3. The maximum forecast concentration in the study area, is 13.9 mg/m^3 and occurs at Market and Santa Clara.

The baseline background concentration levels forecast for 1987 are shown in Table 19 along with 1979 background values.

TABLE 19. CO BACKGROUND CONCENTRATION LEVELS FOR 1979 AND BASELINE 1987 (mg/m^3)

	San Jose	Oakland	Vallejo
1979	12.8	8.	6.
1987 Baseline	9.8	4.5	3.7

An important factor in estimating carbon monoxide baseline trends is the assumption of future traffic growth. The major traffic assumptions for San Jose and Oakland are described below.

San Jose - Current and projected baseline traffic data for the downtown area were provided by the City of San Jose. The baseline case assumes 1990 traffic volumes (the city's base year designation), which conform with the land uses designated in the City's 1981 adopted General Plan. Three major projects assumed in the baseline case are the Transit Mall, Guadalupe Corridor, and the San Antonio Plaza Redevelopment Area (described in Section V).

The City's traffic projections were generated using a computerized traffic forecast modeling package called TRANPLAN. The model is provided with proposed land use distributions within the county, a street system and information on county travel behavior (i.e., vehicle trip generation rates). The diversion of vehicle-trips to transit is reflected by a reduction in the vehicle trip generation rate per household that is input to the model. Other factors influencing vehicle trip generation rates were identified for the horizon year 1990 by the City and a consultant (SRI International) in an effort to incorporate long term economic, social and demographic trends in their transportation planning process. These factors are summarized in Table 20.

TABLE 20. FACTORS AFFECTING FUTURE TRIP-MAKING ACTIVITY IN THE SAN JOSE TRAFFIC FORECAST MODEL

FACTORS THAT REDUCE PRIVATE VEHICLE MODE TRAVEL

o Increased fuel cost

o Temporary or permanent gasoline rationing and spot shortages

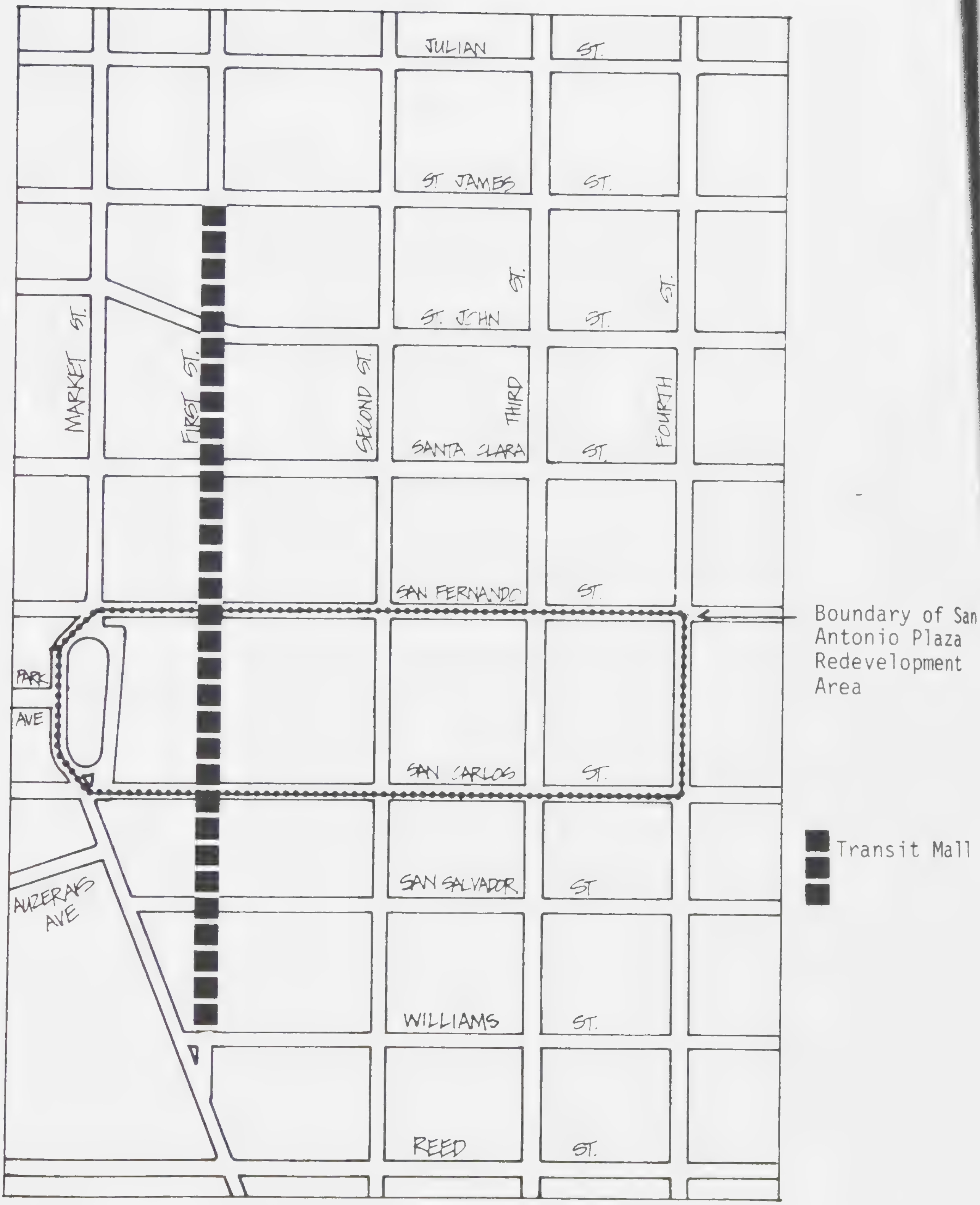


Figure 16. Transit Mall and San Antonio Plaza in Relation to Downtown San Jose

- o Continued decline in average household size

- o County policies that attempt to bring jobs and entertainment/recreation opportunities closer to the urban areas

- o Increase in the proportion of families with two or fewer children

- o Increase in the proportion of older (retired) persons in the population

- o The ability of increasing the number of members of the professional groups to work at home

FACTORS THAT INCREASE PRIVATE VEHICLE MODE TRAVEL

- o Fuel efficient cars

- o Increase in number of workers per household (as a result both the entry of more women into the work force and the increase in the number of unrelated individuals living together)

- o An increase in the number of families with younger children (under 10) as the post-war baby boom generation reaches child bearing age

The trips are distributed to routes on the street system using a capacity constrained route assignment which reflects the impact of traffic congestion on route choice.

Oakland - The baseline case assumes a traffic growth rate of 1 1/2% percent per year through 1987. This includes the effects of full development and occupancy of the City Center Project and Trans-Pacific Centre, as planned in early 1981. Also assumed are:

- o completion of the Grove/Shafter Freeway from 18th Street to the Nimitz Freeway;

- o making 11th Street one-way eastbound with four lanes of traffic and 14th Street one-way westbound, also with four lanes.

The projections of future traffic patterns in downtown Oakland for the baseline case are tentative due to the fact that numerous major commercial projects are currently being planned with significant potential traffic impacts. Plans for the Trans-Pacific Centre have been modified since the baseline inventory was developed. Therefore, the baseline 1987 forecast is tentative also.

Vallejo - Traffic was not expected to grow dramatically in Vallejo within the next five years. Therefore, a conservative traffic growth rate of 1-1/2% per year was used to forecast 1987 CO. If the forecast did not exceed the Federal standard of 10 mg/m^3, then attainment could be predicted with some measure of confidence despite the fact that a traffic study was not explicitly performed for Vallejo.

Implications for Control Strategy Design

The 1987 forecast of baseline carbon monoxide concentration levels shows that the federal eight-hour standard will be attained in Oakland and Vallejo. The existence of a high and pervasive carbon monoxide background level in the urbanized area of San Jose has implications for control strategy design. Simple redistribution of traffic to reduce local congestion is unlikely to produce air quality benefits. Steps must be taken to reduce vehicle emissions on a sub-regional, urban scale--perhaps as large as 200 square kilometers. This result strongly suggests that the most effective approaches to reducing CO levels in San Jose are:

- reducing vehicle emission rates to very low levels via enforcement of new vehicle emission standards, and implementation of a vehicle inspection and maintenance program; and

- adopting and implementing agressive policies to promote travel modes other than the private vehicle.

SECTION IV

OZONE CONTROL STRATEGY DEVELOPMENT

As mentioned in Section III, there is no single, major source of the ozone problem. Instead, there are many sources of different type and magnitude spread over the entire region. Moreover, the long history of air pollution control in the Bay Area means that the most effective and cost-effective control options have already been implemented. The remaining options will generally cost more and have less effect than those now being implemented. By 1987 the maximum hourly ozone level is projected to be 14.4 pphm, 2.4 pphm above the federal standard. To achieve this final increment of air quality improvement, hydrocarbon emission reductions of approximately 85 tons/day are required. (This value will vary slightly depending on the mix of sources and hydrocarbon species that are controlled.)

This section summarizes the alternative control measures considered for the plan, assessment of their costs and effectiveness, and their placement into three categories:

- o control measures recommended for implementation
- o control measures to be held in reserve as contingency
- o control measures considered not reasonably available

MOTOR VEHICLE INSPECTION AND MAINTENANCE

A motor vehicle inspection and maintenance (I/M) program is a vital link in the overall strategy for control of vehicle emissions. Such a program was adopted in the 1979 Plan, but the California Legislature did not authorize the program until September 1982.

Cost and effectiveness estimates for I/M vary widely depending upon the assumptions made about how it will ultimately be designed, implemented, and enforced. Based on recent information from EPA and the California Air Resources Board, the range of probable hydrocarbon emission reductions achievable from the authorized biennial I/M program is 17 to 29 tons/day. (The estimated CO reduction is 367 tons/day.) This range is due to: (1) differing analyses and assumptions concerning the details of how I/M would be implemented; and (2) differing interpretations of data by EPA and ARB. There is no firm technical basis for selecting one estimate of effectiveness over the other; rather, the issue for the Plan is what level of effectiveness should be assumed. This assumption has a direct bearing on what other controls will be needed to achieve the ozone standard.

For the purposes of this Plan, an I/M program yielding a 25% emission reduction effectiveness for both hydrocarbons and carbon monoxide was assumed. This translates to emission reductions of 29 tons/day of hydrocarbons and 367 tons/day of carbon monoxide. This

assumption is at the optimistic end of the range of likely results for a biennial I/M program. To deal with this uncertainty, the Plan continues to support the need for an annual I/M program, and the co-lead agencies have committed to preparing an update of the Plan by October 1984.

While the specific design elements of the I/M program are not yet developed, certain facets can be outlined at this time. First, the program is estimated to cost $31,500,000 per year for the Bay Area on an annualized basis. This cost includes $15 per vehicle tested for the inspection, and an average repair cost of $28 per failed vehicle. The cost effectiveness of this program is $1500 per ton of hydrocarbons and $120 per ton of CO. The program would initially be financed statewide through the appropriation of funds from the State Motor Vehicle Account to the Director of Finance, who would loan the funds to the implementing agency, the Department of Consumer Affairs.

Important potential impacts are possible in the areas of consumer protection and economic impact on low income people. The consumer protection issue is the potential for conflict of interest for the repair industry in performing both the inspection and the repair. Protective measures to mitigate this impact would be automated inspection equipment, the setting of quality assurance procedures, and the provision of referee facilities to review consumer complaints and to settle disputes concerning test results.

Inspection and repair costs may place a special financial burden on lower-income persons, who are more likely to own older vehicles. The possible consequences of an I/M program might be a) an increased incidence of motorists driving without valid registration, b) greater use of public transportation, c) reduced mobility for low-income persons who have no access to public transportation.

STATIONARY SOURCE CONTROL MEASURES

Alternative Control Measures

Forty-two control measures were developed and analyzed for potential hydrocarbon reductions from stationary sources. The measures are listed in Table 21 and explained in greater detail in Appendix A.

Since 1955, the BAAQMD has enacted regulations to reduce emissions from stationary sources. The present controls are summarized in Section II. Over the years, stationary source controls have become more comprehensive and stringent, and most of the "easy" controls have already been adopted. Thus, it may be expected that the new proposals will have some unattractive aspects, in terms of costs, technical requirements, or administrative difficulties. However, in the absence of feasible alternatives, it appeared necessary to develop additional stationary source controls. Apart from drastic lifestyle changes, only vehicle inspection and stationary source controls offer hope for attaining the ozone standard.

TABLE 21. SUMMARY OF ALTERNATIVE STATIONARY SOURCE CONTROLS CONSIDERED (Original listing - many measures were modified during the planning process)

1. **Organic Chemical Manufacturing**: New rule requiring control of volatile organic compound (VOC) fugitive emissions from pumps, compressors, process vessel depressurization and process relief valves. Limits would be similar to existing limits for petroleum refining plants.

2. **General Solvent and Surface Coating Operations**: Modify Regulation 8 - Rule 4 by lowering hourly and daily VOC emission limits.

3. **Letterpress/Offset Printing**: Modify Regulation 8 - Rule 20 by deleting letterpress/offset exemption and adding specific VOC emission limits.

4. **Natural Gas and Crude Oil Production & Processing**: New rule requiring control of VOC fugitive emissions from valves, flanges, pumps, compressors, relief valves, and storage tanks. Limits would be similar to existing limits for petroleum refining plants.

5. **Polymer and Resins Manufacturing**: New rule requiring control of VOC emissions from reactor vessels, etc. by condensation, adsorption.

6. **Wood Furniture Coating**: New rule requiring 50% reduction of VOC through the use of low solvent coatings and high transfer efficiency spray methods.

7. **Volatile Organic Waste Disposal**: New rule requiring stripping and recovery of VOC from wastes prior to disposal.

8. **Aerosol Cans**: New rule banning the use of VOC propellants. Substitute pump, stick, roll-on containers or use N_2/CO_2 propellants.

9. **Marine Lightering**: New rule requiring use of deep draft lighter vessels to reduce lightering emissions.

10. **Ship, Barge, Tanker and Railcar Loading**: New rule(s) requiring 90 to 95% control of VOC emissions by vapor balance, condensation, etc.

11. **Gasoline Distribution**: Modify Regulation 8 - Rule 6 and Rule 7 by lowering exemption cut-offs to require Phase I and Phase II controls at additional service stations.

12. **Architectural Coatings**: Modify Regulation 8 - Rule 3 by lowering the VOC content limit for flat coatings from 250 to 125 grams per liter.

13. **VOC Storage**: Modify Regulation 8 - Rule 5 by lowering control requirement cut-offs from 1.5 psia and 40,000 gallons to 0.5 psia and/or 10,000 gallons.

14. **Automobile Refinishing**: New rule requiring 50% reduction of VOC emissions by lowering VOC content of automobile refinishing coatings.

15. **Pesticides**: New rule banning the use of weed oil, requiring the use of water or other non-VOC carriers and limiting overspray.

16. **Wineries**: New rule requiring control of VOC emissions during fermentation by condensation, absorbtion, etc.

17. **Coatings Manufacturing**: New rule requiring control of VOC emissions from reactors, blenders, mixers, and transfer and storage. Requirements would be similar to existing requirements for pharmaceutical products in Regulation 8 - Rule 24.

18. **Lawnmowers**: New rule banning the sale of two-cycle lawnmowers and limiting hydrocarbon emissions from new four-cycle engines.

19. **Reciprocating Engines** (gasoline/gas fuel): New rule requiring reduction of hydrocarbon emissions from reciprocating engines. Replace two-cycle engines with four-cyle; replace four-cycle engines with electric motors where possible.

20. **Farm Tractors** (gasoline fuel): New rule requiring control of hydrocarbon emissions from new gasoline engine tractors.

21. **Construction Equipment** (diesel): New rule requiring control of hydrocarbon emissions from new and existing equipment.

22. **Vegetable Oil Manufacturing**: New rule requiring control of VOC emissions from extractors, desolventizers, dryers, coolers and conveyors by a mineral oil scrubber and proper maintenance and operation per draft EPA CTG.

23. **Aerospace Assembly and Coating Operations**: Regulation 8 - Rule 29 is being developed, with an independant workshop schedule.

24. **Rubber/Plastic Products Manufacturing**: New rule requiring control of VOC emissions from molding, curing, cementing, etc by condensation, adsorption or incineration.

25. **Pleasure Boats** (gasoline and diesel fuel): New rule requiring hydrocarbon controls on new engines.

26. **Marine Lightering Retrofit**: New rule requiring 90 to 95% control of VOC emissions by vapor balance, condensation, etc.

27. **Off-Road Motorcycles** (gasoline two-cycle): New rule banning the sale of new two-cycle engines in favor of four-cycle.

28. **Industrial Maintenance Coatings**: New rule requiring the use of low solvent coatings for some industrial maintenance applications.

29. **Sanitary Landfill Sites**: New rule requiring the installation of gas collection systems. Gas would be combusted directly or separated into a saleable methane portion and a non-methane portion, to be incinerated.

30. **Marine Vessel Gas-Freeing**: New rule would require gas freeing be conducted outside District waters with exceptions for safety considerations, etc.

31. **Tanker Ballasting**: The Coast Guard has adopted a Rule requiring segregated ballast or a washed ballast tank and an inert gas system for tankers larger than 40,000 DWT.

32. **New Electronics Industry Regulation**: New rule would require control of significant solvent emitting sources by condensation, adsorption, etc.

33. **Coating of Plastics**: New rule would require control of VOC emissions by the use of low-solvent coatings or equivalent control by condensation, adsorption, incineration, etc.

34. **Pleasure Boat Fueling** (gasoline): Modify Regulation 8 - Rule 7 to require control of VOC emissions from pleasure boat fueling with vapor recovery systems.

35. **New Source Review**: Modify the Regulation 2 - Rule 2 to increase the on-site offset ratio for VOC from 1.0:1 to 1.1:1 or 1.2:1 on an annual average basis.

36. **Ozone from Irradiation Beams**: New rule requiring control of directly emitted ozone by scrubbers, etc.

37. **Tree Replacement**: New rule requiring the replacement of 10% of high VOC emitting species with low emitting native species.

38. **Large Commercial Bakeries**: New rule requiring control of oven VOC emissions from large commercial bakeries.

39. **Develope and Tighten Plant Emission Limits**: New rule requiring 10% reduction of current allowable organic emissions for plants emitting more than 100 tons of organics per year.

40. **Airport Fuel Transfer** (gasoline): New rule requiring control of VOC emissions from fuel transfer by the use of vapor balance systems.

41. **New Service Stations**: Modify Regulation 8 - Rule 7 to require the use of secondary assist vapor recovery systems for vehicle fueling at new service stations.

42. **Zero Gap Seals for Floating Roof Tanks**: Modify Regulation 8 - Rule 5 to require installation of "zero gap" seals on most floating roof tanks.

Control Measure Assessment

To make the evaluation and selection process as objective as possible, staff has attempted to specify costs, emissions reductions and photochemical reactivity for each proposed control measure. The measures were then ranked in order of preference based on their projected cost effectiveness. Costs were calculated over a twelve-year period, from 1983 through 1994, to include capital and operating costs. These were discounted back to present value and, finally, equivalent annual cost in 1982 dollars. The effectiveness of a measure can be expressed in two ways, in terms of organic emission reductions (tons/day), or in terms of potential ozone reduction (parts per hundred million). The ozone reduction achievable from each control measure was calculated based on the photochemical sensitivity of a LIRAQ-derived trajectory model which was applied to three important trajectories in the Bay Area. Expense and time considerations preclude the use of the full LIRAQ grid model to evaluate each proposed control measure individually. The trajectory model uses the same photochemical module, however, and provides a valid yet inexpensive substitute for grid model runs.

For the trajectory model evaluation, the expected emission reductions in four organic reactivity classes and the change, if any, in NOx emissions were used to calculate the ozone reduction potential of each proposed control measure. The proposed stationary source measures were then ranked with respect to their cost-effectiveness. The results of this ranking are shown in Table 22. Some of the measures originally studied were not practical, in staff opinion, because of technical feasibility, jurisdiction, or enforcement problems. Those measures judged not reasonably available were not included in the cost-effectiveness ranking process. These are summarized in Table 23 and Appendix D.

The known sensitivity of the LIRAQ grid model was then used to estimate the total tonnage reduction which is likely to produce attainment of the ozone standard in 1987. This provides a preliminary cutpoint for selection of control measures from the ranked list. The chosen measures were then translated into a new 1987 "Control" inventory for a confirmation run in the LIRAQ grid model. From the results of this confirmation run it may prove necessary to adjust the control strategy to demonstrate attainment with the full LIRAQ model on each prototype day. The cutpoint would be adjusted up or down the list as necessary.

Other impacts of the various control measures are detailed in Table 1. The public and elected officials, in review committees, Boards and Commissions, have the opportunity to consider social, economic, political, energy and other impacts of the proposed measures during the review and adoption processes. Such impacts may be deemed important enough to change the ranking and selection of measures.

TABLE 22. RANKING OF PROPOSED STATIONARY SOURCE CONTROL MEASURES IN ORDER OF PREFERENCE BASED ON COST* PER UNIT OZONE REDUCTION

Rank	Measure	BAAQMD ID No.	Cost* Eff ($mil/pphm)	HC Red An Avg (t/day)	Cumul HC Red (t/day)	Cumul Ozone Red (pphm)	Cumul Cost* ($mil)
1.	Tanker Ballasting	31	.01	2.5	2.5	.06	.00
2.	Reciprocating Engines	19	1.38	4.0	6.5	.27	.29
3.	Gasoline Distribution	11	3.14	1.0	7.5	.33	.47
4.	Pesticides	15	3.88	3.7	11.2	.47	1.01
5.	Wood Furniture Coating	6	4.41	1.1	12.3	.52	1.21
6.	Organic Chemical Mfgr	1	6.31	.3	12.6	.52	1.27
7.	Aerospace Assbl & Coating	23	8.76	.5	13.1	.54	1.45
8.	Consumer Solvents	8	8.95	4.0	17.1	.63	2.18
9.	Coating of Plastic	33	10.31	2.0	19.1	.70	2.91
10.	Semiconductor/PC Mfg	32	10.33	5.7	24.8	1.46	10.81
11.	Industrial Maint Coating	28	12.51	1.0	25.8	1.49	11.18
12.	VOC Storage	13	14.51	3.0	28.8	1.56	12.17
13.	Large Commercial Bakeries	38	17.32	1.1	29.8	1.58	12.57
14.	Zero Gap Seals FR Tanks	42	19.39	1.5	31.4	1.62	13.23
15.	Polymer & Resin Mfgr	5	23.89	.2	31.6	1.62	13.35
16.	Rubber/Plastic Prod Mfgr	24	24.46	1.1	32.7	1.65	13.99
17.	Coatings Manufacturing	17	24.50	.2	32.9	1.65	14.14
18.	Nat Gas & Crude Oil Prod	4	26.30	1.6	34.5	1.67	14.58
19.	Sanitary Landfill Sites	29	26.97	7.2	41.7	2.02	24.08
20.	Vegetable Oil Mfgr	22	33.05	.4	42.1	2.03	24.23
21.	Volatile Org Waste Disp	7	34.16	6.0	48.1	2.18	29.53
22.	Automobile Refinishing	14	34.35	5.2	53.3	2.34	34.83
23.	Letterpress/Offset Print	3	37.82	3.0	56.3	2.39	36.83
	Cut-off Line						
24.	Architectural Coatings	12	48.43	1.0	57.3	2.40	37.38
25.	Ship Barge Tanker RR Load	10	65.98	3.0	60.3	2.48	42.28
26.	Gen Solv & Surf Coat Oper	2	69.24	1.5	61.8	2.52	45.58
27.	Pleasure Boats	25	84.35	7.0	68.8	2.76	65.58
28.	New Source Review	35	123.77	.2	69.0	2.77	66.16
29.	New Service Stations	41	340.38	.0	69.0	2.77	66.18
30.	Lawnmowers	18	1.01	.1	69.1	2.77	66.19
31.	Offroad Motorcycles	27	3.86	.8	69.9	2.80	66.31
32.	Wineries	16	26.77	.1	70.0	2.80	66.39
33.	Marine Vessel Gas Freeing	30	32.76	.1	70.1	2.80	66.42
34.	Marine Lightering	9	Unranked Contingency Measure - All Cost and Emission Data Deleted, Further Study Required.				

*Equivalent Annual Cost in 1982 dollars. Capital and operating costs for the period 1983-1994 were discounted to present 1982 values, then converted to annual equivalents. Discount rate was assumed to be 12% per year.

TABLE 23. STATIONARY SOURCE CONTROL MEASURES CONSIDERED NOT REASONABLY AVAILABLE

The following measures were considered in the development of control alternatives, but are not recommended. As described below, these measures are not considered to be reasonably available for attainment of the federal ozone and/or carbon monoxide standards.

Lawnmowers--Ban use of gasoline-powered lawnmowers on high ozone days--Difficult to enforce; could be voluntary. (BAAQMD Control Measure No. 18-B.)

Farm Tractors--Require (hardware) controls on new gasoline tractors--would require ARB to set statewide emissions limits; manufacturers would have to redesign specifically for California market; problems with state law which prohibits control on "implement of husbandry;" difficult to enforce because no registration/licensing system. (BAAQMD Control Measure No. 20.)

Diesel Construction Equipment--Require periodic adjustment to manufacturer's specification--Operators do frequent field maintenance and adjustments for good performance (not lowest emissions); difficult to enforce because no registration system and frequent moves to different job sites, even across state lines. (BAAQMD Control Measure No. 21.)

Pleasure Boats--Ban use of 2-cycle engines on high ozone days--Difficult to enforce. (BAAQMD Control Measure No. 25-B.)

Pleasure Boats--Ban use of all internal combustion engines on high ozone days--Difficult to enforce. (BAAQMD Control Measure No. 25-C.)

Marine Lightering Retrofit--Modify vessels for vapor balance, or equivalent, to achieve 90% control--Difficult to achieve unless statewide or nationwide requirement, or dedicated fleet; safety considerations and Coast Guard jurisdiction; problems with state law. (BAAQMD Control Measure No. 26.)

Off-road Motorcycles--Ban use of off-road motorcycles on high ozone days--Difficult to enforce; could be voluntary. (BAAQMD Control Measure No. 27 B.)

Pleasure Boat Refueling--Require vapor recovery at marinas--Not technically feasible; high cost and low potential for ozone reduction. (BAAQMD Control Measure No. 34.)

Tree Replacement--Require replacement of 10% of trees on public lands in central Bay Area--Politically unpopular; costs and secondary effects unknown. (BAAQMD Control Measure No. 37.)

Plant Emission Limits--Reduce emissions from large stationary sources by 10% below present baseline--Arbitrary reduction of 10% may not be achievable; could be most expensive. (BAAQMD Control Measure No. 39.)

Airport Fuel Transfer--Require vapor recovery at airports for gasoline transfer to trucks and planes--Small emission reduction potential; technical difficulties; safety problems and FAA jurisdiction. (BAAQMD Control Measure No. 40.)

Plan Recommendations

A vehicle inspection and maintenance program is expected to reduce hydrocarbon emissions by 29 tons/day by 1987, so the remaining 56 tons/day must be obtained through stationary source control. Reductions due to transportation controls do not affect this accounting because they are accompanied by NOx reductions which cancel any local ozone benefits.*

Control Measures Recommended for Implementation. From the list of ranked measures, those which are most effective and least costly are recommended for implementation, up to the targeted tonnage of 56 tons/day. This results in a cutoff line below the measure ranked #23 in Table 21. If this Plan is approved, the first twenty-three measures, down through "Letterpress/Offset Printing," will be implemented as new regulations by the BAAQMD. The state Health and Safety Code requires public notice and hearings prior to actual adoption of a regulation, and workshops are usually held to insure an orderly and efficient rule-making process. The actual language development is important because it determines the final cost-effectiveness and enforceability of the regulation.

Control Measures Recommended for Contingency. Based on the Clean Air Act, EPA has developed requirements for contingency planning. Measures in the contingency category will not be needed to attain the ozone standard by 1987 unless something goes wrong. There are circumstances which could make it necessary to review and develop selected contingency measures; some of these are:

- o Inspection/Maintenance program less effective than 29 tons/day;
- o One or more of the recommended measures less effective than present analysis indicates;
- o Delays in adoption of regulations or delays in compliance;
- o Multiple exemptions change reduction estimates;
- o Air monitoring data does not show air quality improvement.

If it does become necessary to obtain further reductions from stationary sources, a process has been defined to re-evaluate and implement some of the measures now in the contingency category. This process is set forth in Section VII of this Plan. Presently the measures ranked 24 through 34 in Table 22 are considered to be in the contingency category. Measures 24-30 appear in the contingency group simply because the analysis showed that they were lower in the cost-effectiveness ranking. Measures ranked 31-34 appeared to be reasonably cost effective, on a $ per unit ozone reduction basis, but they carried high administrative costs or enforcement difficulties, together with small absolute air quality improvements. On a practical basis, these appear to be the least attractive of the ranked measures. They were moved into the contingency group as measures of last resort.

*See discussion of LIRAQ Sensitivity Tests in Section III.

Control Measures Considered Not Reasonably Available. As mentioned above, some of the proposed measures were judged to be not reasonably available--for technical, legal, or administrative reasons. These measures, listed in Table 23 and Appendix D, are effectively dropped from further considerations, although they might be resurrected in some dire circumstance, such as the failure of the State Legislature to enact any I/M program whatsoever.

TRANSPORTATION CONTROL MEASURES

Alternative Control Measures

MTC began the analysis of potential transportation controls with an assessment of the transportation control categories contained in Section 108(f) of the Clean Air Act. Details on this assessment can be found in Appendix B. A brief summary is presented in Table 24.

Assessment and Selection

The results of the preliminary analysis were presented to the Joint Air Quality Planning and Advisory Committee in January. In general, the TCMs were found to be ineffective for a number of reasons:

- The vehicle fleet will be much cleaner by 1987. Cars and light-duty trucks emitted 286 tons/day of HC in 1979. By 1987 this is expected to decrease to 153 tons/day. After accounting for the I/M credits and the daily evaporative emissions (which occur whether or not the car is driven), the amount subject to control is approximately 95 tons. Thus, even if travel were reduced by 10%, HC would be reduced by only 9.5 tons.

- TCMs have only minor impacts on travel. An individual's travel decisions are strongly influenced by the density and types of land uses in a region; thus, it is difficult to influence travel decisions thru TCMs. As an example, the gas price increase in 1979 was quite significant, but resulted in only minor travel reductions.

- Bay Area citizens currently use alternative travel modes to a large extent. For example, the Bay Area has the third highest percentage of commuters on transit in the nation. Because of this, the additional diversions that can be expected from many of the TCMs are fairly small.

- TCMs reduce hydrocarbons and oxides of nitrogen simultaneously, and so have virtually no impact on ozone levels.

Plan Recommendations

These results reinforce the findings in the 1979 Air Quality Plan. In that Plan, because TCMs were not found to be effective, MTC adopted the following guidelines:

Table 24. Assessment of Clean Air Act Section 108(f) Transportation Measures [1]

Section 108(f) Category	Potential Effectiveness[2]
(i) motor vehicle emission inspection and maintenance programs;	Not analyzed as a TCM. Included in Section IV-A of Plan.
(ii) programs to control vapor emissions from fuel transfer and storage operations and operations using solvents;	Not analyzed as a TCM. Included under BAAQMD stationary source controls (Section IV-B).
(iii) programs for improved public transit;	Reductions ranged up to 1.0 tons/day of HC, 10.5 tons/day of CO, and 1.0 tons/day of NO_x.
(iv) programs to establish exclusive bus and carpool lanes and areawide carpool programs;	Depends on specific HOV project. Additional carpool matching programs could achieve reductions of 0.1 tons/day of HC, 1.2 tons/day of CO, and 0.1 tons/day of NO_x
(v) programs to limit portions of road surfaces or certain sections of the metropolitan areas to the use of common carriers, both as to time and place;	HC: less than 0.1 tons, CO: 0.2 tons, NO_x: less than 0.1 tons.
(vi) programs for long-range transit improvements involving new transportation policies and transportation facilities or major changes in existing facilities;	No impacts by 1987.
(vii) programs to control on-street parking;	Short-term impacts could range up to 0.4 tons/day reduction of HC, 1.3 tons/day reduction of CO, and a 0.1 tons/day increase in NO_x. Over the long-term traffic increases would probably negate any reductions.
(viii) programs to construct new parking facilities and operate existing parking facilities for the purpose of park and ride lots and fringe parking;	Programs already in place. Additional efforts would reduce HC by less than 0.1 tons/day, CO by 0.7 tons/day, and NO_x by less than 0.1 tons/day.
(ix) programs to limit portions of road surfaces or certain sections of metropolitan area to the use of nonmotorized vehicles or pedestrian use, both as to time and place;	Reductions from a single auto free zone would be less than 0.1 tons/day of HC and NO_x, and 0.01 tons/day of CO.
(x) provisions for employer participation in programs to encourage carpooling, vanpooling, mass transit, bicycling, and walking;	Programs already in place. Additional efforts could yield reductions of 0.2 tons of HC, 2.1 tons of CO, and 0.2 tons of NO_x.
(xi) programs for secure bicycle storage facilities and other facilities, including bicycle lanes, for the convenience and protection of bicyclists, in both public and private areas;	Bicycling program could reduce HC by 0.6 tons/day, CO by 7.7 tons/day, and NO_x by 0.1 tons/day.
(xii) programs of staggered hours of work;	HC: 0.6 tons, CO: 7.1 tons, NO_x: 0.5 tons
(xiii) programs to institute road user charges, tolls, or differential rates to discourage single occupancy automobile trips;	Reductions up to 0.3 tons/day of HC, 3.5 tons/day of CO, and 0.4 tons/day of NO_x.
(xiv) programs to control extended idling of vehicles;	If 1000 delivery vehicles are controlled, reductions would be less than 0.1 tons/day of HC and NO_x, and 0.2 tons/day of CO.
(xv) programs to reduce emissions by improvements in traffic flow;	Short-term impacts similar to category (Vii). Over the long-term increased traffic would probably negate any benefits.
(xvi) programs for the conversion of fleet vehicles to cleaner engines or fuels, or to otherwise control fleet vehicle operations;	Converting 1000 vehicles to propane would yield reductions of less than 0.1 tons/day of HC and NO_x, and 0.2 tons/day of CO. Replacing 1000 vehicles with electric vehicles would reduce HC and NO_x by less than 0.1 tons/day, and CO by 0.2 tons/day.
(xvii) programs for retrofit of emission devices or controls on vehicles and engines, other than light duty vehicles, not subject to regulations under section 202 of title II of this Act;	Not analyzed as a TCM. ARB, which has responsibility for this measure, has rejected it.
(xviii) programs to reduce motor vehicle emissions which are caused by exteme cold start conditions.	Not applicable to the Bay Area because of the moderate climate.

1. Review of the Section 108(f) revenues is mandated by the Clean Air Act Amendments of 1977.
2. Because estimated amounts are extremely small, errors in estimation could easily be larger than amounts shown.

MTC policy supports measures that improve or enhance alternatives to the automobile without penalizing those dependent on the auto. These alternatives include transit, carpooling, and bicycle systems.

MTC also adopted a specific guideline on pricing alternatives:

Because the impact of specific pricing control measures appears quite small, MTC will consider such control measures only under certain conditions:

1. when problems of social and economic inequities in the transportation system are minimized and adequate transportation alternatives exist;

2. when such pricing measures are necessary to ensure that the transportation plan is feasible;

3. when such a measure is evaluated in detail and subjected to full-scale public hearings.

The current analysis reaffirms these guidelines. In response to concerns raised by EPA, MTC does not use these guidelines to avoid unmet "Basic Transportation Needs." Each situation is reviewed to determine to reasonableness of providing alternative services. Accordingly, a set of 15 TCMs which have a variety of benefits in addition to their emissions benefits is proposed. The recommended measures are shown in Table 25. Further details are provided in Appendix B. In total, these 15 measures would reduce HC by 2.7 tons/day, CO by 26 tons/day, and NO_x by 2.8 tons/day. MTC has endorsed a number of objectives identified by the staff of the California Air Resources Board. However, no additional emission reduction credits are being claimed as a result of these. The objectives are contained in Appendix B.

Measures considered not reasonably available include the following:

1. Significantly increase bridge tolls (HC: -0.1 tons, CO: -0.8 tons, NO_x: -0.1 tons, assuming tolls increased by 30%)

2. Increased parking rates (HC: -0.2 tons, CO; -2.4 tons, NO_x: -0.4 tons, assuming parking rates increased by 50%)

3. Restrict parking on major streets in the morning and afternoon peaks (HC: -0.3 tons, CO: -0.9 tons, NO_x: +0.1 tons. These are short-term impacts. Over the long term, the improved traffic flow may ultimately encourage more traffic.)

4. Substitute electric vehicles for conventionally powered vehicles (HC: -1.5 tons, CO: -11.5 tons, NO_x: -1.0 tons, assuming 100,000 electric vehicles.)

TABLE 25. RECOMMENDED TRANSPORTATION CONTROLS

Proposal	Pollutant Reductions[1]			Energy Impacts gals/gas saved per day
	HC	CO	NOx	
Reaffirm commitment to 28% transit ridership increase between 1978 through 1983.	Already Included in Baseline			---
Support post-1983 improvements identified in transit operator's 5-year plans. After consultation with the operators adopt ridership increase target for 1983-87.	[illegible]	7.15	1.04	31,600
Seek to expand improve public transit beyond committed levels.	0.37	3.69	0.54	16,300
Continue to support development of HOV lanes. (Emission credit would not be allowed for specific projects until environmental studies were completed and funds were programmed.)	Depends on specific project			---
Continue to support RIDES efforts.	Already Included in Baseline			---
Continue efforts to obtain funding to support long-range transit improvements.	No Effect by 1987			---
Reaffirm commitment to to preferential parking programs.	Already Included in Baseline			---

1. Because estimated amounts are extremely small, errors in estimation could easily be larger than amounts shown.

Proposal	Pollutant Reductions			Energy Impacts gals/gas saved per day
	HC	CO	NOx	
Encourage transit operators to work with Caltrans to identify under-utilized lots.	0.04	0.19	0.05	1,900
Expand Commute Alternative Program.	0.87	8.83	0.89	18,000
Develop information program for local governments.	0.69	6.04	0.27	11,300

5. Impose gas rationing (HC: -29.9 tons, CO: -357.1 tons, NO_x: -45.7 tons, assuming supply reduced by 25%.)

Contingency Plan

EPA guidelines require a contingency plan for transportation measures which will be implemented if reasonable further progress is not achieved. This contingency plan contains three elements:

a) List of transportation projects with potentially adverse air quality impacts which will be delayed while the air quality plan is being revised.

MTC believes that providing a list of specific projects in this plan is impractical for two reasons:

- the project list would change depending on the year that the RFP target is not met;
- the environmental documentation on projects in the later years of the Transportation Improvement Program (TIP) is not yet available in most cases.

Accordingly, if the RFP target is not met, MTC may delay certain categories of projects in the TIP if they are shown to have significant adverse impacts on air quality. The criteria for delaying projects and specific projects to be delayed will be determined following the initial public hearing described below. The categories which may be delayed include:

- Freeway Congestion Relief Projects (HB 42)*
- Freeway Traffic Service Projects (HB 43)
- Conventional Highway and Expressway Operational Improvement Projects (HB 44)
- New Connections and Cross-Traffic Improvements (HE 11)
- Upgraded Facilities (HE 12)
- Lane Additions (HE 13)
- New Highways (HE 14)
- Projects funded by the Federal Aid Urban Program which increase roadway capacity.

*Designation refers to CalTrans category.

b) Process for determining/implementing additional TCMs.

In July of each year, an RFP report will be submitted to EPA. Part of this report will be a review of the status of implementation of the adopted TCMs. A second portion would assess the growth in vehicle travel in the region. If a determination is made that RFP is not being met for the transportation sector, MTC will adopt additional TCMs within 6 months of the determination. These TCMs will be designed to bring the region back within the RFP line.

MTC will conduct the following process within the 6-month time frame:

- o hold an initial public hearing to solicit comments on projects to be delayed and suggestions on additional controls;
- o review progress made in implementing controls adopted in the Air Quality Plan;
- o analyze additional controls;
- o hold a final public hearing prior to adoption of additional measures.

c) Annual Inspection/Maintenance Program.

MTC will support legislative authorization for an annual I/M program.

Basic Transportation Needs

The Clean Air Act Amendments of 1977 require that non-attainment regions institute comprehensive public transportation measures to meet basic transportation needs. The Bay Area currently has an extensive transit network which fulfills this criterion. This includes 21 scheduled public transit carriers, 31 publicly subsidized accessible van services, and 25 publicly subsidized accessible taxi services. Together these ensure that Bay Area citizens, including the elderly and handicapped, are able to travel without depending on private automobiles.

MTC does not define a minimum transit service level but instead relies upon the individual transit operators to determine how best to serve their area with the funds available. Each of the six major operators is required to address this in their 5-year plans and MTC reviews these prior to allocation. The rural counties of the Bay Area (Sonoma, Napa and Solano) are able to use Transportation Development Act (TDA) funds for streets and roads if they have no unmet transit needs. MTC conducts public hearings in these counties prior to making a determination on unmet transit needs.

The operating budgets of the ten major transit carriers, along with the federal, state, and local operating subsidies for each, are shown on pages 4-27 through 4-36 of the 1981-82 Transportation Improvement Program for the Nine County San Francisco Bay Area. These budgets were adopted by the transit operators and MTC has committed to the subsidies for which it has responsibility.

ADMINISTRATIVE PROGRAMS FOR LONG-TERM MAINTENANCE

Two administrative programs that would enhance the ability of the region to maintain improved air quality over the long term are recommended for the plan--these programs are Advisory Review of Local Projects and Plans, and Conformity Assessment of Federally Supported Activities.

Advisory Review of Projects and Plans

This program is directed toward new or modified facilities, both public and private, and plans that could result in significant impacts on air quality. Such facilities would include major shopping centers, office developments, large housing developments, highways, airports, parking structures and entertainment complexes. While they are not direct air pollution sources themselves, they do attract large volumes of vehicle traffic which can lead to air quality problems. Such review systems are currently in effect on a mandatory basis at Lake Tahoe and other areas in the nation.

The Advisory Review system proposed here would be, as the name implies, advisory in nature. It would be conducted administratively as part of Plan and Project Review functions and would use the existing California Environmental Quality Act environmental document process as the primary vehicle for receiving information and communicating comments. The three co-lead air quality planning agencies (ABAG, MTC, BAAQMD) would cooperate in developing comments on specific projects, and would work with cities, counties and project sponsors to minimize adverse air quality impacts. Special relationships would be established with local jurisdictions in known or suspected CO exceedance areas (i.e., San Jose and other cities in Santa Clara County, and Oakland) to ensure that relevant plans and project proposals with potentially significant impacts are reviewed as early in their planning stages as possible. The air quality benefits of this measure are at present unquantifiable--it is recommended for incorporation into the 1982 Plan to help ensure long-term maintenance of federal standards in the Bay Area.

Conformity Assessment of Federally-Supported Activities

This program is intended to implement the provisions of Section 176(c) and Section 316 of the Clean Air Act. Section 176(c) provides that:

> "(c) No department, agency, or instrumentality of the Federal Government shall (1) engage in, (2) support in any way or provide financial assistance for, (3) license or permit, or (4) approve, any activity which does not conform to a plan

after it has been approved or promulgated under section 110. No metropolitan planning organization designated under section 134 of title 23, United States Code, shall give its approval to any project, program, or plan which does not conform to a plan approved or promulgated under section 110. The assurance of conformity to such a plan shall be an affirmative responsibility of the head of such department, agency, or instrumentality."

Section 316 permits EPA to withhold, condition or restrict sewage treatment grants under Section 201 of the Clean Water Act if an area:

"does not have in effect, or is not carrying out, a State implementation plan approved by the Administrator which expressly quantifies and provides for the increase in emissions of each air pollutant...which increase may reasonably be anticipated to result directly or indirectly from the new sewage treatment capacity which would be created by such construction."

The section further permits grant restrictions if:

"...the construction of such treatment works would create new sewage treatment capacity which--...may reasonably be anticipated to cause or contribute to, directly or indirectly, an increase in emissions of any air pollutant in excess of the increase provided for under the provisions...[of] the applicable implementation plan...."

The proposed program would be conducted as part of ABAG's Plan and Project Review function. As the areawide clearinghouse for all federal grant applications (under requirements of the Federal Intergovernmental Cooperation Act and the Federal Demonstration Cities and Metropolitan Development Act), ABAG's Executive Board comments on federal grant applications for conformity with adopted regional policies, including provisions of the air and water quality management plan. Hence conformity assessment under the two sections cited above can be easily conducted using ABAG's existing Plan and Project Review function--sometimes referred to as the A-95 process after Office of Management and Budget Circular A-95. The other co-lead agencies (MTC and the BAAQMD) regularly participate on the staff-level review team, and, as proposed, would continue to do so. This could be formalized through an amendment to the existing Memorandum of Understanding between the three agencies regarding air quality planning.

LAND USE MEASURES

The following language was adopted by the governing boards of the co-lead agencies regarding land use measures for this Plan:

Land use measures, along with transportation control measures, are needed to curb auto emissions as the region grows, and assure maintenance of adequate air quality to the year 2000 and beyond. However, this Plan does not advocate that regional policy bodies should require land use control

measures. Cities and counties should consider modifying their general plans to: contain development in urban service areas with urban services in place; encourage mixed-use development and infill on vacant land at densities sufficient to support transit; and encourage rehabilitation and reuse of older buildings.

Additional measures identified by the Joint Air Quality Planning and Advisory Committee and the California Air Resources Board for consideration in the Plan are described in Appendices B and C.

IMPLEMENTATION SCHEDULE

The control programs recommended for implementation would be phased in during the period from 1983 to 1987, beginning with the most effective programs. Approximate dates for the Stationary Source programs are indicated in Table 26. Table 27 and Figure 17 illustrate the overall year-by-year progress that is expected for hydrocarbon emission reductions with both existing and proposed control programs. Figure 18 presents the results of the LIRAQ assessment of the proposed control strategy, confirming attainment of the ozone standard. The schedule of implementation milestones for the recommended transportation controls is summarized for each measure as follows:

1. **Reaffirm commitment to 28% transit ridership increase between 1978 and 1983.**

   - Measure is currently being implemented by operators. A 25.6% increase in ridership has been recorded over the first 3 years of this period.

   - MTC assesses effectiveness of increase in annual RFP reports.

2. **Support post-1983 improvements identified in operator's 5-year plans, after consultation with the operators adopt ridership increase target for 1983-1987.**

   - 6 major transit operators adopt FY 1983-87 plans by July, 1982.

   - MTC consults with operators on ridership targets by January, 1983.

   - MTC, through implementation of the TIP and allocation of regional funds, seeks to ensure operators' 5-year plans are implemented.

   - Ridership gains are monitored through annual RFP reports.

TABLE 26. TENTATIVE SCHEDULE FOR IMPLEMENTATION OF STATIONARY SOURCE CONTROL MEASURES

ID #	C/E*	Measure Ranked by O_3 Reduction	Draft Regulation Written	Regulation Presented to Board	Implement
32	10	Semiconductor/PC Mfg.	83	83	84
29	19	Sanitary Landfill Sites	83	84	84
19	2	Reciprocating Engines	84	84	85
7	21	Volatile Org. Waste Disp.	84	84	85
14	22	Auto Refinishing	84	84	85
15	4	Pesticides	83	84	84
33	9	Coating of Plastics	84	85	85
13	12	V.O.C. Storage	84	85	85
8	8	Consumer Solvents	84	85	85
11	3	Gasoline Distribution	84	85	85
3	23	Letter Press/Offset Printing	84	85	85
6	5	Wood Furniture Coating	85	85	86
28	11	Industrial Maint. Coating	85	85	86
38	13	Large Commercial Bakeries	85	86	86
42	14	Zero Gap Seals FR Tanks	85	85	86
24	16	Rubber/Plastic Prod. Mfg.	85	86	86
23	7	Aerospace Assbl. & Coating	82	82	83
1	6	Organic Chemical Mfg.	85	86	86
17	17	Coatings Mfgr.	86	86	87
4	18	Natural Gas & Crude Oil Prod.	85	86	86
5	15	Polymer & Resin Mfgr.	86	86	87
22	20	Vegetable Oil Mfgr.	86	86	87
31	1	Tanker Ballasting (U.S. Coast Guard)	--	--	--

*Indicates ranking based on cost-effectiveness.

TABLE 27. ANNUAL HYDROCARBON EMISSION REDUCTIONS FROM RECOMMENDED CONTROL PROGRAMS (TONS PER DAY)

YEAR	1979	1980	1981	1982	1983	1984	1985	1986	1987
Baseline hydrocarbon emissions with existing control programs under 1979 Plan (not including biogenic)	732	690	652	615	582	560	545	530	515
Emission reductions from motor vehicle inspection and maintenance	--	--	--	--	--	9	17	23	29
Emission reductions from 23 stationary source measures	--	--	--	--	1.1	9.5	24.0	38.8	56.3
Emission reductions from 15 transportation measures	--	--	--	--	0.3	0.9	1.4	1.8	2.2
Hydrocarbon emissions with the 1982 Plan implemented (not including biogenics)	732	690	652	615	581	541	503	466	428

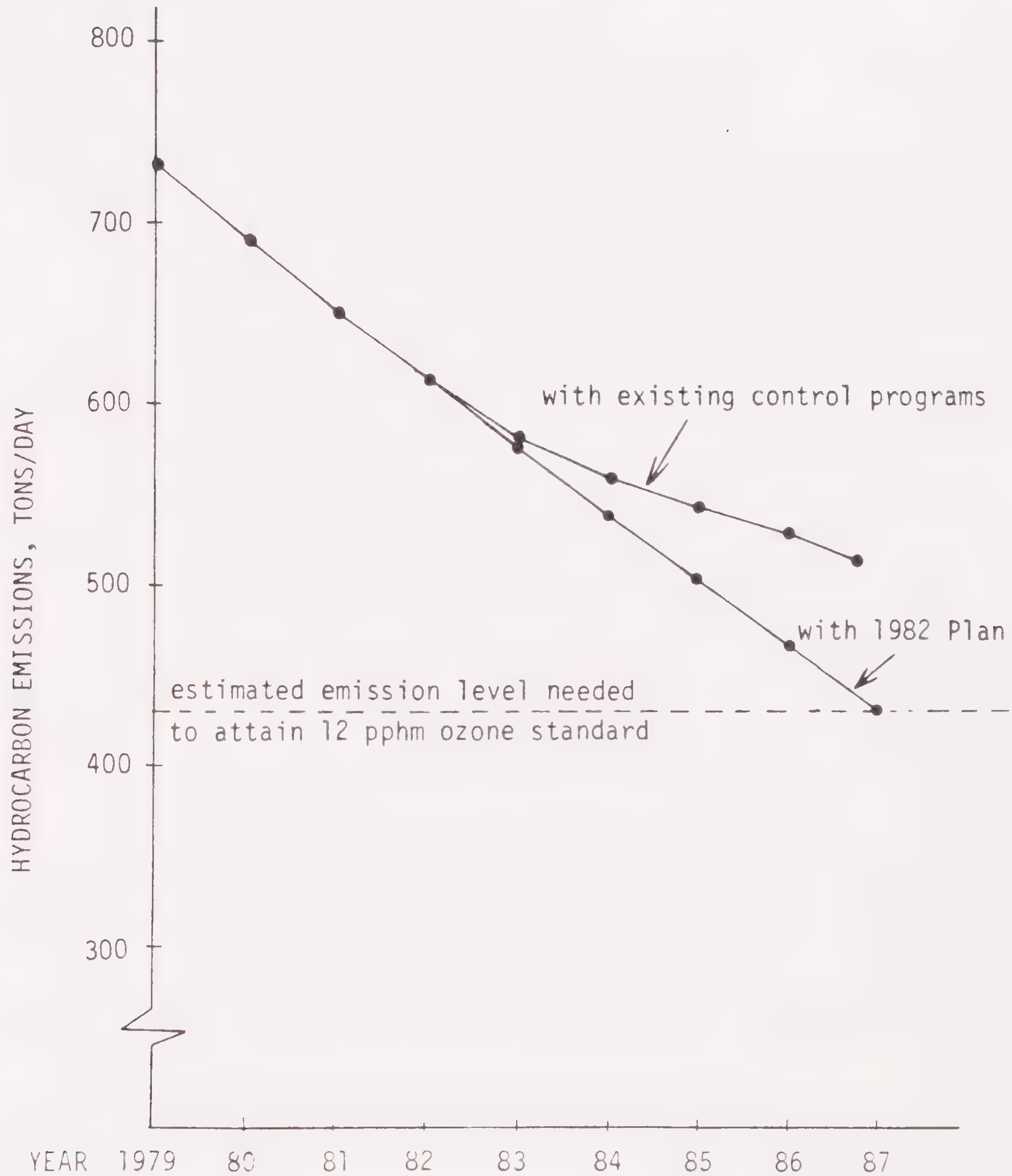


Figure 17. Schedule of Hydrocarbon Emission Reduction Proposed to Achieve the Federal Ozone Standard in the San Francisco Bay Area

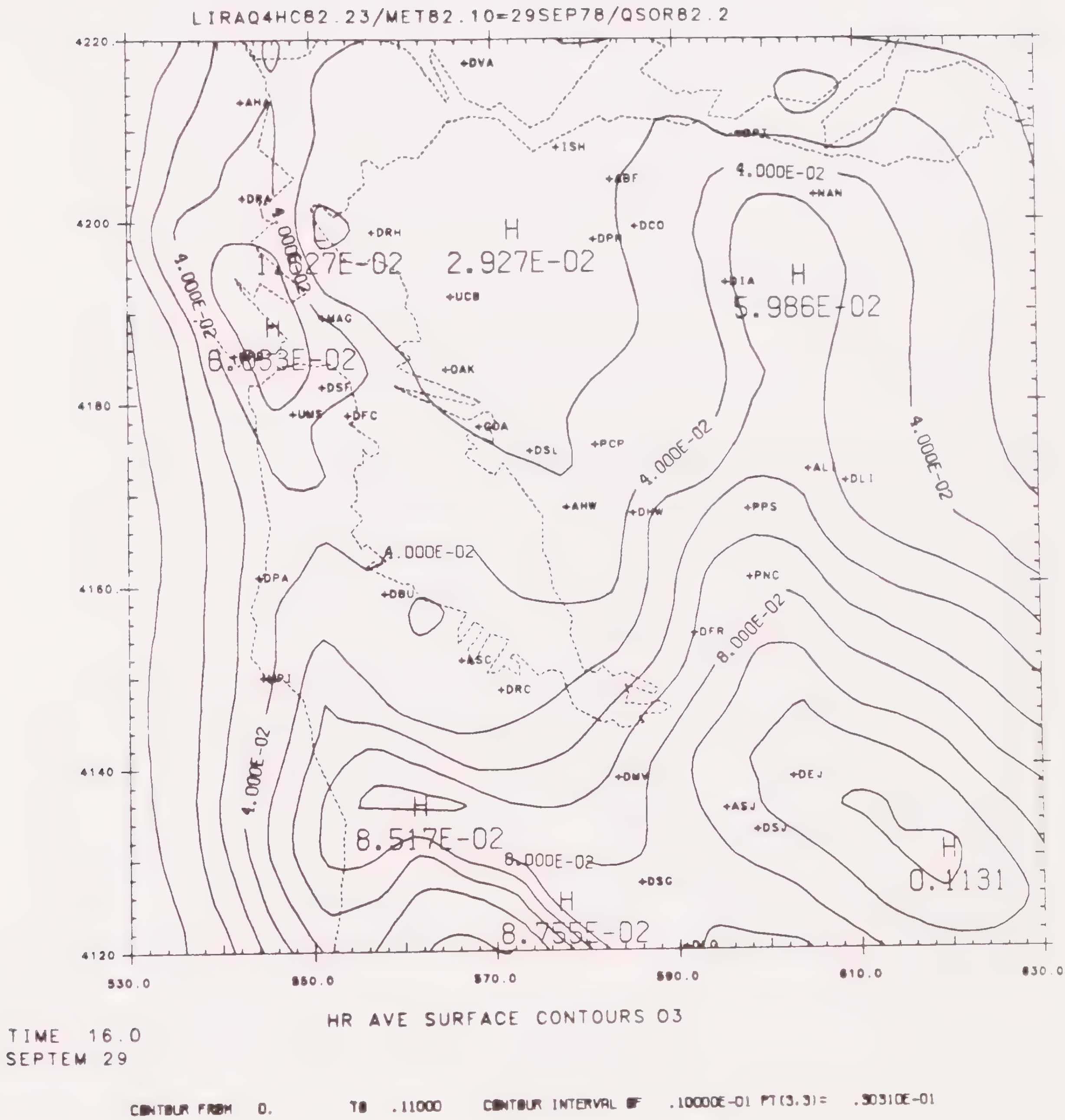


Figure 18. LIRAQ-Generated 1987 Maximum Ozone Concentrations on Design Value Day with the Proposed Ozone Control Strategy.

3. **Seek to expand and improve public transit beyond commited levels.**

   o MTC seeks sources of new revenue--ongoing effort.

   o If funding exists, additional projects and service programmed in FY 84-88 Transportation Improvement Program (July, 1983).

4. **Continue to support development of HOV lanes. (Emission credit would not be allowed for specific projects until environmental studies were completed and funds were programmed.)**

   o MTC will continue to support HOV lanes where justified on a case-by-case basis. The following are projects where HOV lanes are being considered:

   - I-580 through Dublin Canyon - EIS to be completed Fall, 1982, project implementation by 1987.

   - I-580 from Rte. 24 to Bay Bridge - EIS to be completed Fall, 1983, project implementation by 1987.

   - Rte. 101 in Marin (Stage 2) - Negative Declaration under review, project implementation by 1986.

   - I-80 - EIS to be completed September, 1983, project implementation unknown.

   - Rte. 237 from Lawrence Expressway to Rte. 17 - environmental documentation under review, construction by 1984-85.

5. **Continue to support RIDES efforts.**

   o Measure is currently being implemented. RIDES adopts budget to continue program in July of each year.

   o Effectiveness of measure assessed in annual RFP reports.

6. **Continue efforts to obtain funding to support long-range transit improvements.**

   Assuming funding for new rail starts:

   o Guadalupe - engineering design to be completed Fall, 1983

   - construction anticipated to be completed by 1986

- o BART extensions to North Concord and Warm Springs

    - design begins in FY 82-83

7. **Reaffirm commitment to preferential parking program**

    - o Caltrans to open 6 lots in FY 1982-83, 3 in FY 1983-84, and 8 in FY 1984-85.

    - o Assess effectiveness of measure in annual RFP reports.

8. **Encourage transit operators to work with Caltrans to identify under-utilized lots along major transit lines which could be used as park-and-ride lots.**

    - o Continue the ongoing program which will establish 14 new joint use parking lots per year.

    - o Assess effectiveness in annual RFP reports.

9. **Expand Commute Alternatives Program.**

    - o Conduct two training sessions each year for the years 1983 through 1987.

10. **Develop information program for local governments.**

    - o Compile and print handbook of traffic and air quality mitigation measures for local governments by July 1983.

    - o Conduct outreach/training program during FY 83-84.

DEMONSTRATION OF ATTAINMENT

New source inventories were compiled to represent emissions in 1987 after implementation of all of the recommended control measures. Organic reductions (from the 1984 baseline inventory) were: I/M 29 tons/day, stationary sources 56 tons/day, and mobile sources 2 tons/day. The mobile source reductions, due to transportation control measures, also include 2 tons/day of NO_x.

The resulting 1987 control inventory was used in a LIRAQ run to demonstrate that the emission reductions proposed are sufficient to reach the ozone standard of 12 pphm. Figure 18 shows the maximum hourly ozone values after implementation of all the recommended control measures. The maximum simulated value was 11.5 pphm, from 3 to 4 pm, in the area east of downtown San Jose. The resulting 1987 design value was 11 pphm, below the 12 pphm standard.

SECOND PROTOTYPE DAY

Some critics of the 1979 Plan suggested that a demonstration of attainment using ony one historical prototype day meteorology was not sufficient. For the 1982 NAP process two separate ozone episodes were selected as representative of worst case design value conditions. The selection process is described in Section III, and the specific meteorology is discussed in Tech Memo 44 (Duker, 1982). A second prototype day, September 12, 1979, was used to augment the results described above for the 9/29/78 prototype day. LIRAQ results for 9/12/78 meteorology with the 1987 control strategy inventory were 11.2 pphm for the maximum simulated hourly ozone, and 11 pphm for the resulting design value. These results demonstrate attainment with meteorology from two independent, but representative, historical ozone episodes.

SECTION V

CARBON MONOXIDE CONTROL STRATEGY DEVELOPMENT

ALTERNATIVE CONTROL MEASURES

The most appropriate types of measures for reducing carbon monoxide emissions are motor vehicle emissions controls and transportation controls. Another set of controls is concerned with land use and applies to projects and development patterns that might result in significant adverse impacts on air quality. The alternative categories of controls are described below.

Motor Vehicle Emissions Controls

Carbon monoxide emissions occur primarily during engine start-up and while the vehicle is in operation. The emission rate varies substantially with speed, being greatest when the vehicle is idling or operating at low speeds such as those occurring under congested, stop-and-go traffic conditions. The catalyst technology in use on post-1974 model year automobiles is most effective in reducing exhaust emissions. As the number of vehicles with catalyst systems increases, the average emissions per vehicle mile will decrease.

The Air Resources Board currently has regulations that control emissions from light-, medium-, and heavy-duty gasoline powered vehicles, diesel powered trucks and buses, and motorcycles. In addition, the ARB has in effect various regulations and procedures to ensure that emission standards are met.

In September 1982, the California legislature authorized a biennial vehicle inspection and maintenance program. Required by the 1977 Clean Air Act Amendment to attain the ozone standard by 1987, the inspection and maintenance program would also be an important measure in the carbon monoxide control strategy.

Another program which could potentially reduce vehicle emissions is the Gasoline Conservation Awareness Program (GasCAP). GasCAP is a comprehensive conservation program to help agencies reduce gasoline consumption without impairing services. It establishes training programs within employer groups to teach proper trip planning, vehicle maintenance and driving techniques. No definitive studies are available on the effectiveness of the program in reducing emissions. However, during the 1980 prototype year, there was a demonstrated 10 to 46% reduction in fuel use by the various participating agencies; the concomitant modification of driving behavior is expected to produce changes in the driving cycle which result in a net reduction in emissions.

Examples of additional motor vehicle emissions control programs are:

- More stringent new vehicle emission standards
- Exhaust retrofit for heavy-duty gasoline vehicles
- More stringent certification of compliance procedures

- o More comprehensive new motor vehicle surveillance program
- o Emission standards for other mobile sources

Vehicular emission control is only practical on a regional or statewide basis, and would be effective in reducing emissions for the entire area.

Transportation Controls

Transportation controls for reducing ambient carbon monoxide levels are designed to reduce travel or to relieve congestion (thus raising vehicle speeds). On the other hand, improving traffic flow on roadways already experiencing acceptable levels of service does not necessarily benefit air quality--the improvement may serve to attract more traffic.

Section 108(f) of the 1977 Clean Air Act Amendments lists 18 categories of Reasonably Available Control Measures. These measures are described in Section IV. As part of the EPA requirements for developing the Nonattainment Plan, each of the 18 measures must be reviewed, and if any measure is not included in the control strategy, the technical, economic, or institutional reasons for exclusion must be explicitly stated. Such a review of reasonably available transportation control measures was the basis for developing the carbon monoxide control strategy for San Jose. For carbon monoxide hot spot problems, only those controls over which the city or county has jurisdiction for implementation were considered in the strategy.

Land Use Measures

Land use measures are designed to reduce the number and length of automobile trips. Three candidate land use measures are identified for the carbon monoxide control strategy. Two of them--Advisory Review of Projects and Plans and Conformity Assessment of Federally Supported Activities--apply to specific projects.

Advisory Review of Projects and Plans - This measure is analogous to new source review for stationary sources, but is aimed at traffic-generating projects such as shopping centers, parking structures, and office buildings. The review would be performed prior to construction to assess air quality impacts. Mitigation measures would be proposed if problems were identified. The advisory nature of this measure means that mitigation is not mandatory. Another version of this measure is mandatory review where mitigation measures are required to be adopted in order for a permit for construction to be issued. Advisory Review for carbon monoxide problems should be implemented at the local, city level in consultation with ABAG, BAAQMD and MTC for two reasons: first, the CO problem is sub-regional in scale; and second, familiarity with the land use and economic plans of the affected city would result in a more balanced review.

Conformity Assessment of Federally Supported Activities - This measure is intended to implement the provisions of Section 176(c) and Section 316 of the Clean Air Act. Section 176(c) requires that federal funding or approval be denied to any activity which does not conform to the 1982 Plan. Also, no metropolitan planning organization can approve any activity which does not conform to the 1982 Plan. Section 316 permits EPA to withhold, condition or restrict sewage treatment grants

if an area does not implement on EPA-approved State Implementation Plan. The measure would be implemented at the regional level with participation by such agencies as ABAG, BAAQMD and MTC.

Limit Retail/Commercial Development Growth in the Central Business District (CBD) - Carbon monoxide problems typically occur at congested intersections within the CBD. A limit on development growth would prevent the concomitant growth in vehicular emissions that leads to a deterioration of urban air quality.

CONTROL STRATEGY DEVELOPMENT

Since the implementation of transportation control measures would be the responsibility of the city (or county), a key aspect of carbon monoxide control strategy development was the involvement of the affected cities' traffic engineering, planning and public works departments and the public transit districts. In San Jose, where the CO problem of the three cities is most severe, an arrangement was formalized whereby the City provided baseline traffic data, drew up a list of candidate mitigation measures and assessed the economic, financial and institutional impacts of each of the measures. For Oakland, a traffic consultant recommended by the City provided the necessary traffic data. Since Vallejo is so close to the standard and since traffic is not expected to grow dramatically, it was projected that the standard would be obtained by 1987 as a result of the current vehicle emission standard program. Therefore, traffic data for Vallejo was not required.

Following are descriptions of candidate measures considered for control strategy development in each city, the criteria for their selection, and the effectiveness of these measures which are recommended for implementation in the control strategy.

San Jose

Twelve candidate transportation mitigation measures were selected for San Jose on the basis of one or more of the following criteria: transit accessibility, traffic circulation, compatibility with parking management policies, pedestrian and bicycle mobility, compatibility with downtown development plans, environmental quality, costs and financial feasibility, community acceptibility and beneficial economic impacts on the downtown area. Table 28 is a comparison of the twelve candidate measures with the Clean Air Act Section 108(f) measures. A description of each measure and the specific criteria used in its selection are described below:

(1) Transit Mall - The 1978 Downtown San Jose Transit Mobility Study recommended a countywide transit system capable of carrying a major share of the county's commuters. The system could be efficiently integrated with regional transportation, and would enhance the revitalization of the downtown area. A key element in the integrated system would be the implementation of a transit mall in downtown San Jose. (See Figure 15.) The Transit Mall would have beneficial impacts on: transit service, auto and truck circulation, downtown parking

TABLE 28. COMPARISON OF CANDIDATE SAN JOSE TRANSPORTATION MEASURES WITH CLEAN AIR ACT SECTION 108(f) MEASURES

Section 108(f) Measures	Transit Mall	Guadalupe Corridor	Bus Fleet Expansion	County Park-and-Ride	City Parking Controls	Post Street Mall	Bicycle Routes and Lanes	Southern Pacific Improvements	Bay Area Rides Program	Commute Transportation Program	Vapor Emissions Control	Vehicle Idling Control
1. Motor Vehicle Inspection and Maintenance Programs												
2. Vapor Emission Control Programs											X	
3. Improved Public Transit	X	X	X	X				X				
4. Exclusive Bus and Car-pool Lanes/ Area wide Car-pool Program	X	X							X	X		
5. Limiting Use of Section of Roadways to Common Carriers	X	X										
6. Long-range Transit Improvements	X	X	X	X				X				
7. On-street Parking Controls	X				X	X						
8. Park-and-Ride and Fringe Parking				X	X							
9. Pedestrian Malls	X					X						
10. Employer Incentive Programs										X		
11. Bicycle Lanes and Facilities							X					
12. Staggered Work Hours										X		
13. Road Use Charges or Tolls For Single Occupancy Auto Trips												
14. Controls on Extended Vehicle Idling												X
15. Traffic Flow Improvements		X										
16. Conversion of Fleet Vehicles to Cleaner Engines or Fuels												
17. Programs for Retro-fit of Emission Control Devices on Non-regulated Vehicles												
18. Programs to Reduce Emissions Caused by Extreme Cold Start Conditions												

(Column group heading: Candidate San Jose Transportation Measures)

management, pedestrian mobility, downtown development plans, environmental quality (countywide air quality improvements) and reduced fuel consumption.

(2) Guadalupe Corridor - The Guadalupe Corridor includes a four-lane highway between I-280 and Curtner Road, a 750-vehicle countywide bus fleet and upgraded Southern Pacific rail services on the existing line. (See Figure 15.) The principal criteria used in the selection of the Guadalupe Corridor improvements as a transportation mitigation measure were: a) improvements to public transit service through the provision of an efficient north/south connection between the county's southern residential areas and the employment centers to the north and in the downtown; b) ease of implementation (corridor runs along existing Route 85 and 87 right-of-ways); c) environmental quality; d) parking management in the downtown area; e) areawide traffic circulation improvements; f) economic feasibility (to be largely federally funded); g) compatibility with other downtown development projects such as the Transit Mall and the San Antonio Redevelopment Project; and h) downtown retail, commercial and cultural development.

Although the Guadalupe Corridor and the light rail system have been approved for construction, the necessary commitment for funding is still pending.

(3) Bus Fleet Expansion - The Santa Clara County Transportation Agency (SCCTA) expects to increase its bus fleet to 750 vehicles by the mid-1980's ("750-Plan"), delivering reliable bus service to within one-quarter mile of approximately 80% of the county's population. The "516-Plan" was created in 1976, when county voters approved a one-half cent sales tax to support public transit. Under the "516-Plan", the bus fleet reached 516 buses by the end of 1981. The completed system will consist of a basic network of 50 routes covering about 250 square miles, with 15 minute headways most of the day on half of the routes and 30 minute headways on the other half. After construction of the proposed Guadalupe Corridor and the downtown Transit Mall projects, the bus network will service all major commercial and cultural activities and important employment centers in the county.

The primary criteria used in the selection of the "750-Plan" and the "516-Plan" were: a) improvements to countywide transit service; b) reduced parking demands in the downtown area; c) pedestrian mobility; d) environmental quality; e) areawide traffic circulation improvements; f) economic feasibility; g) compatibility with downtown development plans; and h) community acceptibility.

(4) County Park-and-Ride - Along with the bus fleet expansion, the SCCTA plans to construct several

park-and-ride facilities to support existing and future express bus system needs. Future park-and-ride lots will generally be located in the area south of Highway 280 and east of Highway 17, near residential areas in the South County and the beginning of many commute trips. The lots will be located along the proposed Guadalupe Corridor and service bus routes leading into the downtown area.

SCCTA plans to create an additional 500 parking spaces per year. It is estimated that when all future park-and-ride facilities are constructed (by 1990), they will be utilized by approximately 50 percent of express bus riders in the county. This program encourages transit ridership and reduces parking demand in the downtown area.

(5) City Parking Controls - In 1977 the City of San Jose initiated a pilot program which provided shuttle bus service between the Central Business District (CBD) and a 400-space park-and-ride lot under Highway 280 at Vine and Almaden. This program was suspended in mid-1981 due to a lack of patronage, and will not be resumed until there is sufficient demand. San Jose is also considering a peripheral parking and fringe parking program to be implemented in the future, when development intensity and employment increases warrant it. Peripheral parking lots would be located 2,000 feet or more from the CBD and would be served by shuttle buses. Fringe and peripheral parking lots are planned to provide approximately 5,000 additional spaces.

On-street parking is currently prohibited on segments of Market, Second, St. James, St. John, Santa Clara, San Fernando and San Carlos Streets. When the downtown Transit Mall is constructed, there will be additional on-street parking restrictions along First and Second Streets (between St. James and San Carlos Streets). These parking restrictions have been implemented: 1) to allow bus stops, 2) to allow loading zones, and 3) to facilitate traffic circulation.

(6) Post Street Mall (Existing) - The Post Street Mall is a pedestrian mall located along Post Street between South Market Street and South First Street. Improvements to this mall were approved by the City of San Jose and the San Jose Redevelopment Agency in 1978 and are now under construction. One of the principal objectives of the mall is to encourage pedestrian-oriented retail activity.

(7) Bicycle Routes and Lanes (Existing) - In the vicinity of the study area, bicycle routes run along Williams, Sixteenth, Seventeenth, San Antonio, St. John and St. James Streets. Bicycle lanes are also located along Fifth, Seventh, St. James and Seventeenth Streets.

(8) Southern Pacific Improvements - A variety of capital and operational improvements are being implemented and planned for the Southern Pacific (SP) service, including:

- o Lease/purchase of existing SP train stations
- o Rehabilitation and improvement of SP train stations, including additional parking facilities
- o Construction of new SP train stations
- o Rehabilitation of rail trackage
- o Lease/purchase of cars, coaches, locomotives, and equipment for improved, effective and efficient operations

Operational improvements include a 30% subsidy program and the addition of 52 daily trains to upgrade service and encourage "reverse direction" commuters. Since Southern Pacific has significant available capacity and provides a high speed link through congested areas of Santa Clara County, efforts are being made to increase its share of commuter trips within the county. These efforts include: 1) connecting local and express buses to the SP depot; 2) providing additional bicycle and auto parking at the SP depot; 3) connecting shuttle service from North County SP depots to industrial areas; and 4) providing combined ticketing or free transfers from train to bus. Relocation of the San Jose depot to North First Street is also being considered. The relocation would provide a convenient interconnection between the Transit Mall and SP.

The planned improvements to the SP service were selected as candidate mitigation measures based upon the following criteria: a) improvements to commuter transit service; b) compatibility with downtown development; c) parking management; d) improvements to areawide traffic circulation; and e) environmental quality.

(9) Bay Area RIDES Program (Existing) - The Bay Area RIDES Program coordinates car and vanpooling for the entire Bay Area, including Santa Clara County. Interested persons are provided with a list ("Match List") of all other interested persons having similar origins, destinations and working hours. The origin and destination information is stored and organized by computer and is updated every six months. The RIDES Program also provides assistance in establishing vanpools. Ten or more persons wishing to start a vanpool are assisted in obtaining a leased van and proper operator's license for one principal and two back-up drivers.

(10) <u>Commute Transportation Program</u> - Santa Clara County Transit has developed and adopted a program to achieve a significant improvement in commuter transportation by 1990 (SCCTD, 1982). The program, which consists of: a ridesharing program, an express bus service, park and ride, upgrading of Southern Pacific rail service and high occupancy vehicle lanes, is targeted to have 50% of all commuter trips using some form of alternative (to single occupancy auto) transportation by 1990 (about twice the current percentage). Key participants in the program's

implementation will be the Santa Clara County Manufacturing Group which includes most of the major firms in the County, and RIDES, a regional ridesharing program operated by Caltrans. Companies participating in the program sponsor transportation coordinators and provide incentives for alternative modes. These incentives may be more convenient parking for ridesharing, free bus passes and bicycle lockers and showers.

(11) Vapor Emissions Control (Existing) - In the San Francisco Bay Area vapor emissions at gasoline service stations are controlled by a vapor recovery system. Vapors from gasoline and other fuel delivery trucks are also controlled by vapor recovery systems. Vapor recovery devices are mandated in the San Francisco Bay Area by a rule of the Bay Area Air Quality Management District.

(12) Control of Extended Vehicle Idling (Existing) - Control of extended vehicle idling is provided by the San Jose City Council Policy 6-10. This policy discourages drive-up windows at banks, restaurants and other commercial establishments in the downtown area of San Jose, including the study area designated in this report. Provisions of this policy also prohibit or discourage drive-up commercial development elsewhere within the city.

The candidate transportation measures listed above satisfy one or more of the provisions of Section 108(f) of the Clean Air Act to reduce or control air pollutant emissions. Those provisions of Section 108 (f) that are fulfilled by each mitigation measure are listed on the matrix in Table 28. As shown on the matrix, provisions for items 13, 16, 17 and 18 were not selected for implementation and are not fulfilled by the candidate mitigation measures. (Item 1, motor vehicle inspection and maintenance, is considered to be a motor vehicle emissions control measure.) The reasons for not selecting these items for implementation are given below.

(13) Tolls and Road User Charges - A program of road user charges or tolls for single-occupancy vehicles (or differential rates to discourage single-occupancy vehicles) was not selected as a candidate mitigation measure because it would be impractical to implement. Toll roads are effective when one roadway segment provides the single shortest or fastest link between two points, such as a bridge across a river or a bay. Under these conditions, a toll station can be constructed at one end of the bridge or road segment. However, in the Greater San Jose Area there is no such single roadway segment, but rather a network of freeways, highway, expressways, and other roadways. The installation of a toll collection facility would only serve to further reduce the flow of traffic on a particular route and divert vehicles to alternative routes. In addition, delays and idling, as well as stops and starts at the toll facility, would tend to offset the air quality benefits of decreased single-occupancy vehicle use.

(16) Conversion of Fleet Vehicles to Cleaner Engines or Fuels - The conversion of fleet vehicles to cleaner engines or fuels was not selected as a candidate mitigation measure due to difficulties in implementation and enforcement. These difficulties result from the fact that vehicles are registered with the State, rather than with local jurisdictions. Therefore, no mechanism is available for implementing and enforcing the conversion of fleet vehicles at the local level without duplicating State registration procedures. For this reason, a program to convert fleet vehicles would be most effectively and efficiently implemented by the State. In addition, the benefits that would be realized are estimated to be small, since the percentage of fleet vehicle miles is a relatively small percentage of the total vehicle miles.

(17) Retrofitting of Emission Devices - A program for retrofitting emission devices or controls on vehicles and engines (other than light-duty vehicles, not subject to regulation under Section 202, Title 2 of the Clean Air Act) was not selected. The reasons for not selecting this program were essentially the same as for the previous mitigation measure (16. Conversion of Fleet Vehicles). Specifically, a retrofitting program was not selected because of difficulty and expense of implementation and enforcement, and because the actual emission reduction benefits are estimated to be small relative to the expense and effort of implementation.

(18) Programs to Reduce Emissions Caused by Extreme Cold Start Conditions - Programs to reduce emissions from extreme cold start conditions were not selected as a candidate mitigation measure because the Greater San Jose Area does not experience conditions of extreme cold.

With the exception of the Commute Transportation Program and the Guadalupe Corridor light rail transit system, all of the candidate mitigation measures described above are projected to be implemented by 1987. Therefore, these measures are assumed as part of the 1987 baseline case. Although the light rail system is an approved part of the Corridor project there are uncertainties in federal funding committments and consequent uncertainties in the project's schedule for completion of construction. Therefore, the Commute Transportation Program is recommended for implementation and light rail transit is a contingency measure.

The 1987 projected high and pervasive background carbon monoxide level which approaches the eight-hour standard of 10 mg/m^3 has implications for strategy development. Since the local component of the concentration at an intersection is attributable to idling or free-flowing vehicles at the intersection, and the background component is generally attributable to areawide vehicle emissions, measures that would reduce local traffic congestion would not be as effective in reducing background levels as measures that would reduce emissions areawide.

Control Measure Effectiveness

According to EPA guidelines, the biennial I/M program would be equivalent to an annual program that would reduce carbon monoxide emissions by 25%. On an areawide inventory basis, I/M would reduce emissions by a lower percentage --estimated to be 19%-- because the program applies to light and medium duty vehicles only while the inventory includes travel by all vehicle categories.

At the local level the emissions, and consequently the local CO concentration component, would be reduced by the full 25%. The resulting 1987 concentration values are shown in Figure 19. The eight-hour standard continues to be exceeded at Market and Santa Clara, where the maximum 1987 baseline concentration was forecast. Therefore, additional mitigation measures are required.

If the Commute Transportation Program were to achieve its target of 50% of the county's commuters using alternative (to single occupancy auto) transportation modes, a greater share of commuters would participate in ridesharing. This would be equivalent to raising the 1987 average vehicle occupancy rate from a projected 1.2 to 1.39 and would reduce vehicle miles of travel during the commute period by 13.9%. It is assumed that background would be reduced by an equivalent amount.

The effectiveness of the Commute Transportation Program is shown in Table 29 assuming that I/M is also implemented. With the two programs, the CO concentration is 9.9 mg/m^3 at Market and Santa and 8.6 mg/m^3 at the hot spot site, First and Santa Clara. Since Market and Santa Clara is forecast to have the highest 1987 baseline concentration and since the controls apply uniformly to the study area intersections, attainment of the standard at this intersection implies that attainment is achieved throughout the study area.

Two other control measures, which are designed to reduce local emissions are Advisory Review and Conformity Assessment. Although their air quality benefits cannot be determined, the merits of implementing these measures are as follows: (1) the institutional mechanisms already exist; (2) they force federal agencies and local jurisdictions to focus on air quality problems; (3) large projects in jurisdictions with air quality problems can be given more intensive review; and (4) potential air quality problems can often be mitigated.

A control measure for which air quality benefits cannot be quantified but would yield positive emission reductions is GasCAP. Since emission reductions due to this program could not be quantified, no reductions are claimed at this time. The measure is recommended to help ensure long term maintenance of both CO and ozone standards in the Bay Area.

The recommended control strategy in San Jose therefore consists of the following measures:

o Motor Vehicle Inspection and Maintenance
o Commute Transportation Program

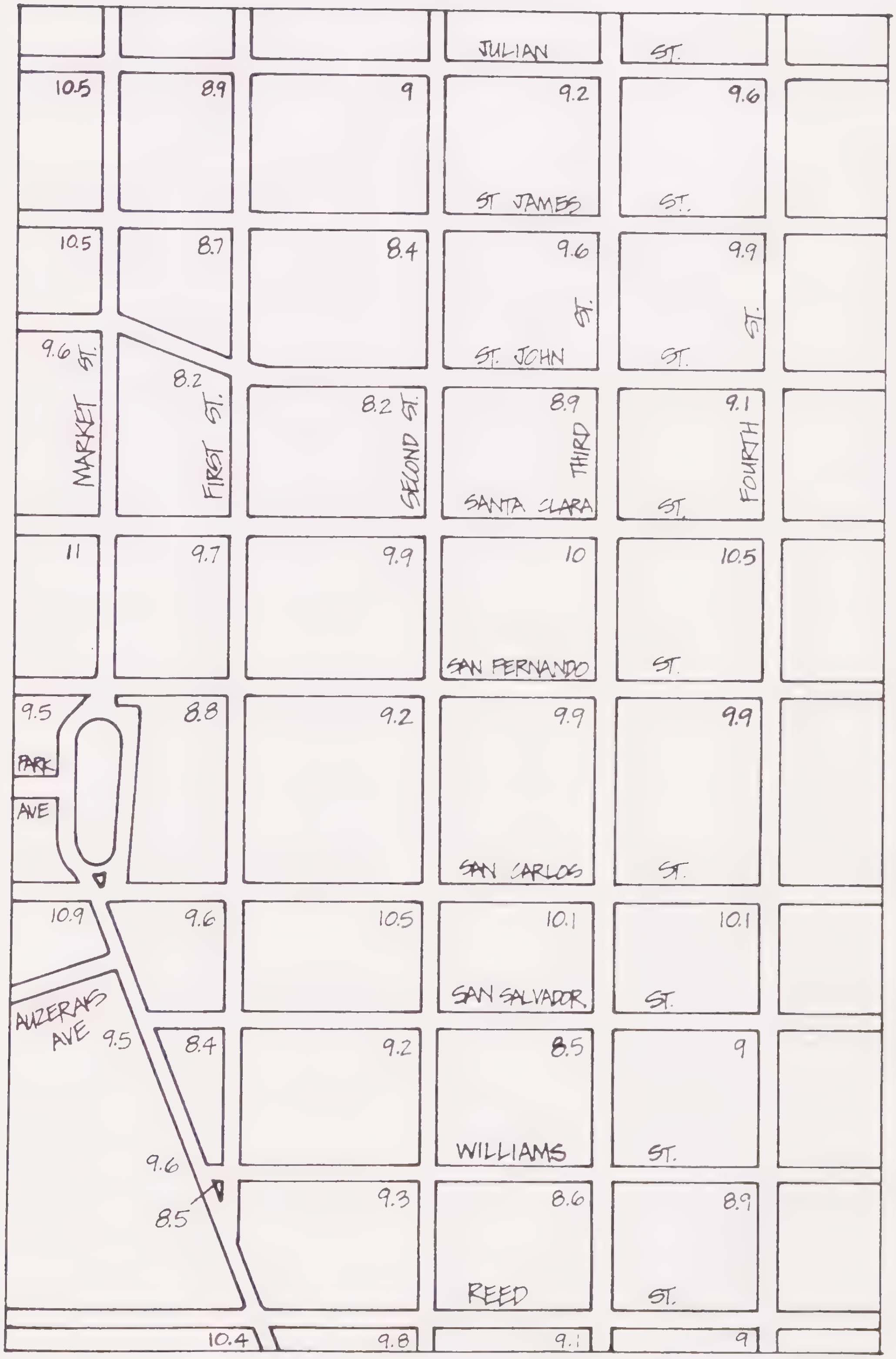


Figure 19. **Expected 1987 CO Concentrations in Downtown San Jose with Motor Vehicle Inspection and Maintenance Program** (eight-hour average)

TABLE 29. CUMULATIVE EFFECTIVENESS OF PROPOSED CONTROL MEASURES ON CO CONCENTRATIONS IN SAN JOSE

Carbon Monoxide Concentrations (mg/m^3)

Intersection	1987 Baseline			With I/M[1]			With I/M, CTP[2]		
	Local	Background	Total	Local	Background	Total	Local	Background	Total
Market/Julian	3.43	9.78	13.2	2.57[3]	7.92[4]	10.5	2.57	6.82[5]	9.4
Market/Santa Clara	4.12	9.78	13.9	3.09	7.92	11.	3.09	6.82	9.9
First/Santa Clara	2.38	9.78	12.2	1.79	7.92	9.7	1.79	6.82	8.6
Second/San Salvador	1.74	9.78	11.5	1.31	7.92	9.2	1.31	6.82	8.1
Fourth/Williams	1.36	9.78	11.1	1.02	7.92	8.9	1.02	6.82	7.8

Notes:

1. I/M = Motor Vehicle Inspection and Maintenance Program
2. CTP = Commute Transportation Program
3. 75% of baseline local concentration
4. 81% of baseline background concentration
5. 86.1% of background concentration, with I/M

- o Advisory Review
- o Conformity Assessment
- o GasCAP

Contingency measures, which would be implemented if it were found that reasonable further progress toward attainment was not being made, are as follows:

- o Implement the recommendations of the Santa Clara Valley Corridor Evaluation, which include a light rail transit system for the Guadalupe Corridor. This measure is currently being pursued, but is included as a contingency measure because funding is not certain at this time.

- o Implement more stringent statewide carbon monoxide exhaust emission standards on light-duty vehicles--approximately 50% reduction from current prescribed levels (7 to 3.4 gm/mile). This measure is already recommended in the 1979 Plan for implementation by 1990.

- o Implement a master synchronized signal control system for the downtown San Jose area.

- o Implement a Transportation System Management Plan and parking policies for the downtown San Jose area.

Oakland

The 1987 baseline projection for the Oakland hot spot site indicates attainment. This is a tentative finding only, however, because significant commercial growth is being forecast for downtown Oakland over the next ten to fifteen years. Most of the development would occur in the Central District Area shown in Figure 20. Some eighteen million gross square feet (gsf) of office space are being planned, or more than double the office floor area that currently exists. Almost two million gsf of retail space, 1,000 hotel rooms and up to 1,500 residential units are also being proposed or are under construction. The status and scope of the projects were not sufficiently defined at the time the baseline inventory was being developed; therefore, they are not in the baseline cases. The impacts of these new projects on traffic circulation and air quality could be substantial; unfortunately, an analysis of the potential impacts and a determination of mitigation measures are beyond the time frame and scope of this plan.

Since these development proposals will establish the Central Business District as a major travel destination in the Bay Area, potential impacts on CO air quality are of concern for Oakland. In order to identify contingency control measures, a study of the cumulative impacts of downtown development is needed to determine future transportation problems and to identify appropriate mitigation measures.

Environmental impact reports (EIRs) identify the traffic and air quality impacts of individual projects, but the determination of the cumulative impacts of all the projects is beyond the scope of any single report. At present, a transit improvement study for the Central Business District is looking at the impacts of growth on transit. Transit, however, is only one aspect of the transportation problem.

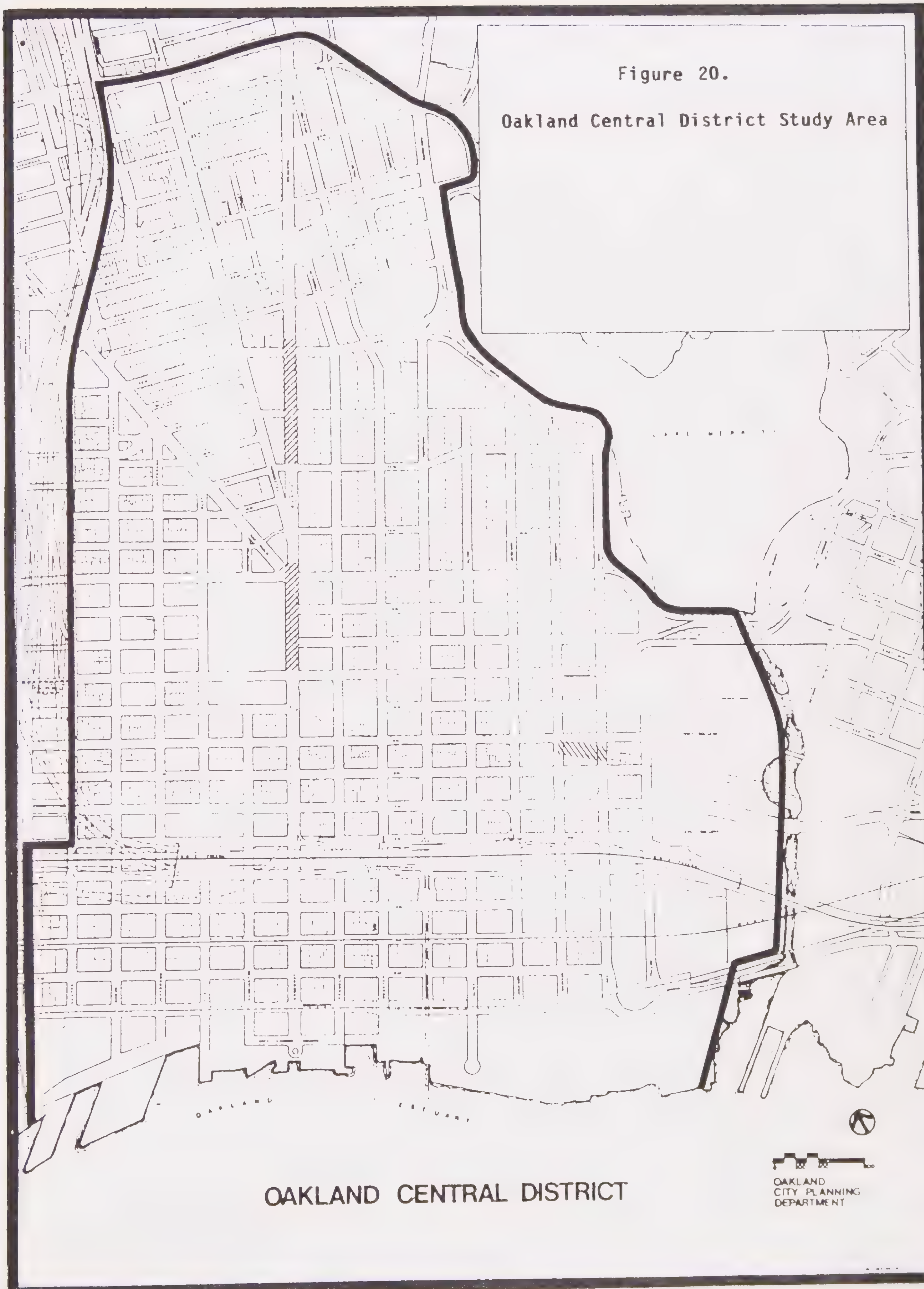


Figure 20.

Oakland Central District Study Area

There is a need for a comprehensive transportation and air quality study of future traffic circulation, transit capacity and operations, parking capacity, funding opportunities for transportation systems improvements and air quality. The study would examine what role transit would play in serving future development, which areas would experience severe congestion, and consequently, air quality problems and what transportation improvements would be needed to mitigate these impacts.

The City of Oakland is identifying funding for the transportation and traffic analysis portions of the study. ABAG, BAAQMD, and MTC would provide technical assistance to the City for the air quality assessment portion of the study. This assessment would include an intensive hot spot monitoring program to establish background concentration levels, the ambient carbon monoxide and the effects of meteorology and topography on ambient carbon monoxide. Mitigation measures would be identified and assessed in conjunction with the transportation study. Thus, the recommended control strategy in Oakland is:

- o Perform a Comprehensive Transportation Plan and Air Quality Analysis of Oakland Central Business District Development

- o Advisory Review of Plans and Projects

- o Conformity Assessment

Advisory Review and Conformity Assessment are recommended for the same reasons described for San Jose. Contingency measures for Oakland would be:

- o Inspection and Maintenance

- o Implement more stringent CO exhaust emission standards in light-duty vehicles--approximately 50% reduction from current prescribed levels (7 to 3.4 gm/mile).

- o Additional measures pending results of the comprehensive transportation and air quality analysis of Oakland Central Business District development.

<u>Vallejo</u>

The reference concentration value (or design value) for Vallejo is close to the standard--12 mg/m^3. The 1987 baseline projection indicates that the eight-hour federal standard will be attained. This will be as a result of (1) more, cleaner cars on the roads due to continued implementation of State vehicle emissions standards; and (2) traffic levels are not expected to grow dramatically in Vallejo as they are in San Jose and Oakland. No control additional measures are recommended for Vallejo.

RECOMMENDED CARBON MONOXIDE CONTROL STRATEGY

In summary, the objective of the carbon monoxide control strategy is to attain the federal eight-hour standard in the Bay Area. Based upon special hot spot and permanent monitoring data, exceedances of the federal eight-hour standard have been measured in a number of cities.

The three cities with the most severe CO problems are San Jose, Oakland and Vallejo.

A key factor in control strategy design was the issue of background contribution to the total concentration. It was determined that, under certain circumstances, measures that would reduce local traffic congestion would not be as effective as measures that would reduce emissions areawide. Therefore candidate control measures were selected on the basis of whether they would reduce emissions over a large area.

The carbon monoxide control strategy is summarized in Table 30. The list of control measures comprising the strategy is divided into four categories for each city: (a) those recommended for implementation; (b) those to be held in reserve as contingency; (c) additional measures; and (d) those not reasonably available. Contingency measures are identified to satisfy EPA guidelines for approval of 1982 SIP revisions. The measures listed in the contingency plan would be considered for implementation if it were later found that "reasonable further progress" toward attainment was not being made. Additional measures make up a special category which was recommended for inclusion by the Joint Air Quality Planning and Advisory Committee. These measures are also part of the ozone control strategy and are described in Section IV. "Not reasonably available" measures may be technically effective, but are not recommended for implementation or inclusion in the contingency plan at this time.

The rationale for the last two categories of control measures (additional and not reasonably available) is to demonstrate that all alternatives have been considered. Measures considered not reasonably available were rejected because they are infeasible for economic, enforcement or implementation reasons or unnecessary due to the existence of more effective measures. In some cases, effectiveness is not possible to quantify or is judged marginal.

In San Jose, where of the three cities the carbon monoxide problem is most severe, five measures are recommended for implementation--Inspection and Maintenance, the Commute Transportation Program, the Gasoline Conservation Awareness Programs (GasCAP), Advisory Review, and Conformity Assessment. In Oakland, a comprehensive transportation plan and air quality analysis, Advisory Review, and Conformity Assessment are recommended. In Vallejo, the trend toward lower vehicle emissions as a result of the existing California vehicle emissions program is sufficient to attain the CO standard by 1987.

The implementation of more stringent statewide CO emission standards for light-duty vehicles (from 7 to 3.4 grams/mile) is recommended as a contingency measure for San Jose and Oakland. The federal standard for new cars in all states other than California is already at 3.4 gm/mi. In San Jose, there are the additional contingency measures of implementing light rail transit system as part of the Guadalupe Corridor project, implementing a synchronized traffic signal control system in the downtown area and implementing a Transportation System Management Plan and parking policies in the downtown area. In Oakland, additional contingency measures will be identified by a comprehensive study of the transportation and air quality impacts of Central Business District development.

TABLE 30. SUMMARY OF RECOMMENDED CARBON MONOXIDE CONTROL STRATEGIES

San Jose	Oakland	Vallejo
Measures Recommended for Implementation	Measures Recommended for Implementation	Measures Recommended for Implementation
o Motor Vehicle Inspection and Maintenance o Commute Transportation Program o Gasoline Conservation Awareness Program o Advisory Review o Conformity Assessment	o Comprehensive transportation plan and air quality analysis of Oakland CBD development o Advisory Review o Conformity Assessment	o None required
Contingency Measures	Contingency Measures	Contingency Measures
o Light Rail Transit System (Guadalupe Corridor) o Implement more stringent CO exhaust emission standards on light-duty vehicles--approximately 50% reduction from current prescribed levels (7 to 3.4 gm/mi) o Master synchronized signal control system for downtown San Jose o Transportation System Management Plan and parking policies for downtown San Jose	o Implement more stringent CO exhaust emission standards on light-duty vehicles--approximately 50% reduction from current prescribed levels (7 to 3.4 gm/mi) o Additional measures pending results of transportation plan and air quality study.	o None required
Measures Not Reasonably Available	Measures Not Reasonably Available	Measures Not Reasonably Available
o Limit commercial/retail development growth in CBD [1,2]	o Limit commercial/retail development growth in CBD [1,2]	o None required

1. Considered not reasonably available due to conflict with other objectives (e.g. economic revitalization of urban center)
2. Limited effectiveness, since urban background CO accounts for a significant portion of the total concentration, and this measure affects primarily the local CO component.

A control measure that is not reasonably available for San Jose or Oakland is to limit commercial/retail development growth. While such a limitation would prevent further deterioration of air quality in the Central Business District, it would be counter to the economic goals of the cities and the region. Furthermore, a limit on commercial/retail development in San Jose would have limited effectiveness due to the predominance of urban background CO in that area. A limit upon growth may reduce the localized CO component but this would have little effect on the background level.

REASONABLE FURTHER PROGRESS (RFP)

Uncertainties in the data and evaluating methodologies make monitoring for reasonable further progress (RFP) an important element of the CO control strategy in addition to the recommended control measures. A program for evaluating RFP will be developed that includes the following:

(1) An annual program of traffic counts at key intersections in downtown San Jose.

Targeted for scheduled traffic counts would be those intersections which currently experience and will continue to experience significant levels of congestion through 1987. Although Market and Santa Clara is forecast to have the maximum CO level in 1987, the highest CO level may actually occur elsewhere in the downtown area. Several key intersections need to be surveyed in the event travel and development patterns change and result in a shift of the CO problem. Another variable for which data will be collected is traffic speed. Average speed is one determinant of the vehicular emission rate. Traffic counts are currently conducted by the City on a regularly scheduled basis. Coordination among the co-lead agencies responsible for air quality planning and the City will be required in order to obtain the data.

(2) A procedure to assess the effectiveness and progress of SCCTD's Commute Transportation Program.

Developing a procedure would require the following tasks to be performed:

- o Assessment of data sources - identify current data collection programs and determine whether supplemental data are required.

- o Selection of travel indicators - Travel indicators are surrogate variables for measuring changes in air quality. The choice of indicators will be a function of their correlation with air quality, the availability of data over the time period of interest and data collection costs.

Examples of travel indicators are: traffic volume, traffic speed, auto occupancy, transit ridership, bicycle trips.

- o Preparation of a schedule for each travel indicator for the period 1982-1987. These schedules would comprise the basis for tracking RFP.
- o Development of a data collection procedure that would produce statistically significant data to permit a trend analysis of the travel indicators. Sampling parameters such as geographic area, frequency of sampling, time period (e.g., season) would be identified.

(3) The tracking of vehicle turn-over and deterioration trends.

Assumptions on vehicle turn-over and deterioration trends influence the mobile source emissions inventory. The ARB mobile source emissions program, EMFAC6, incorporates the impact of these trends on vehicle emissions. Any significant changes in EMFAC6 would require a revision of the RFP schedule.

(4) The tracking of the effectiveness of motor vehicle inspection and maintenance on vehicular emission rates.

Up-to-date estimates of I/M effectiveness will be reflected in the annual evaluation of RFP.

(5) The tracking of ambient CO concentration levels.

Ambient CO trends are difficult to evaluate because of the extreme variability of concentration levels over time and space. An index of air quality would be developed that would suppress the weather related fluctuations in CO. Over the long term, this index would serve as the ultimate measure of RFP. The tracking mechanisms described thus far focus on surrogate indicators of air quality. Actual air quality trends may not match those of the surrogate indicators for a number of reasons, e.g., errors in the measurement of the indicators or the existence of emission sources for which surrogate variables have not been identified, such as residential and wood burning.

(6) Implementation of Advisory Review and Conformity Assessment.

These administrative programs would help determine whether the actual growth in jobs and trips is consistent with baseline assumptions. A significant deviation from the baseline assumptions would warrant a revision in the RFP schedule. While all of the above tasks apply to San Jose, Advisory Review and Conformity Assessment would be used to ensure attainment in Oakland and Vallejo as well.

RFP Schedule

The RFP schedule for carbon monoxide is divided into two parts: one schedule for hot spot emissions and one for areawide emissions. Table 31 and Figure 21 show the RFP schedules for the baseline and control cases. The schedule is developed for the hot spot intersection because it is where high levels of CO were actually measured. Since the recommended strategy is designed to achieve attainment at Market and Santa Clara, it overcontrols at First and Santa Clara. Consequently, the control case results in a concentration level of 8.6 mg/m^3 at First and Santa Clara. Motor vehicle inspection and maintenance is assumed to be implemented in 1984 and the remaining measures are assumed to be implemented in 1983.

Since actual vehicular emissions inventories cannot be measured, RFP tracking relies on surrogate variables to indicate what the emissions trends are. There are several technical issues concerning the use of surrogate variables.

(1) The relationship between emissions and air quality is not accurately defined. Changes in emissions may not accurately portray changes in ambient pollutant levels.

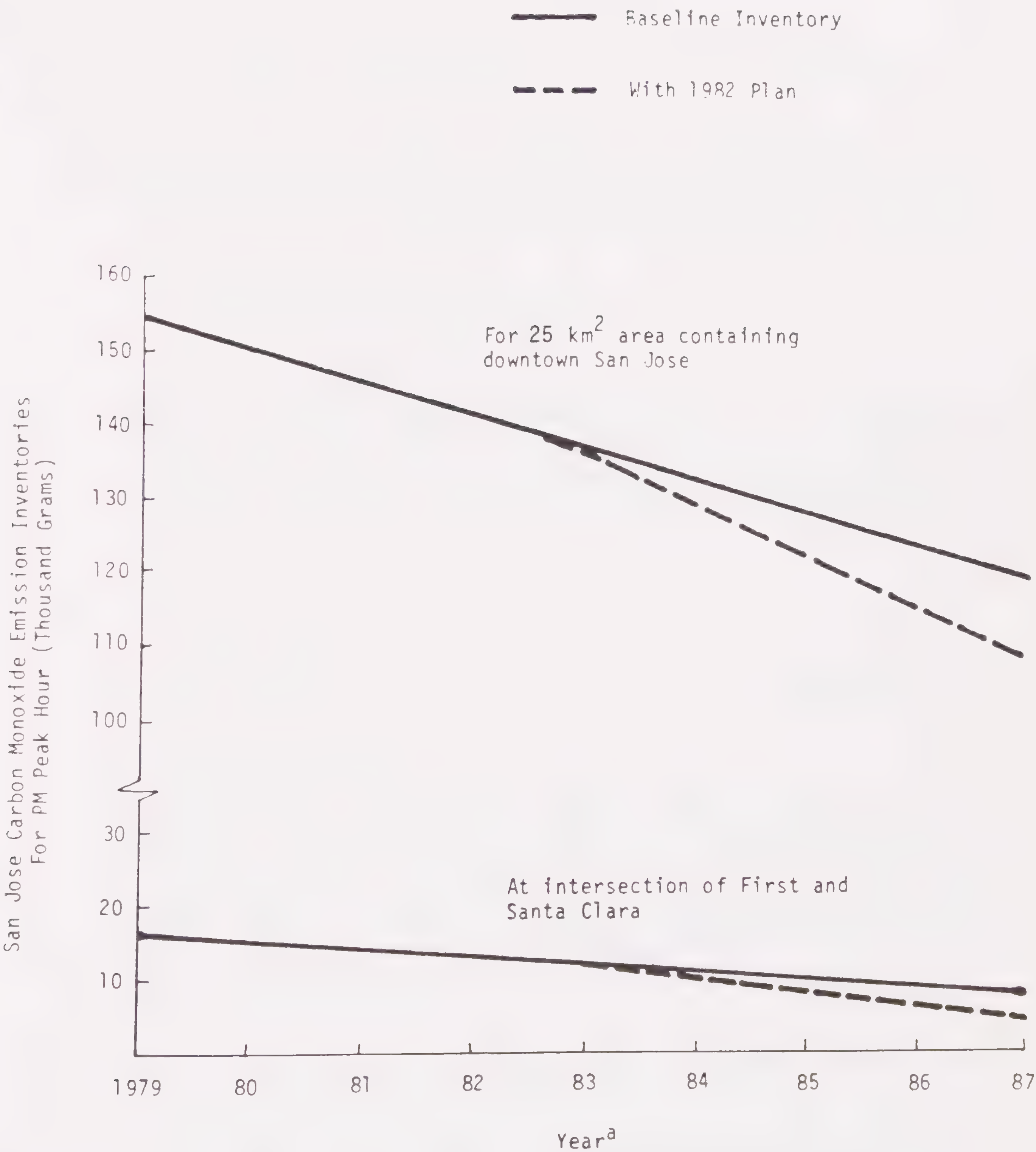
(2) The relationship between surrogate variables and actual emissions is not clearly defined. Observing a change in a surrogate variable does not guarantee that there is a corresponding change in air quality.

(3) There is considerable uncertainty in the measurement of surrogate variables. These uncertainties can produce ever greater uncertainties in projected ambient air quality levels.

TABLE 31. ANNUAL CARBON MONOXIDE EMISSION REDUCTIONS FROM THE RECOMMENDED CONTROL STRATEGY

	1979	1980	1981	1982	1983	1984	1985	1986	1987
Baseline CO Emissions									
Hot Spot[a]	15,263	14,414	13,565	12,716	11,867	11,018	10,169	9,320	8,474
Areawide[b]	154,800[c]	150,300	145,800	141,300	136,800	132,300	127,800	123,300	118,800
Emission Reductions From:									
Motor Vehicle Inspection and Maintenance									
Hot spot	-	-	-	-	-	512	1,023	1,535	2,046
Areawide	-	-	-	-	-	1,404	2,808	4,212	5,760
Commute Transportation Program									
Hot Spot	-	-	-	-	-	-	-	-	-
Areawide	-	-	-	-	1,008	2,016	3,024	4,032	5,040
CO Emissions With 1982 Plan									
Hot Spot	15,263	14,414	13,565	12,716	11,867	10,506	9,146	7,785	6,428
Areawide	154,800	150,300	145,800	141,300	135,792	128,880	121,968	115,056	108,000

a. At First and Santa Clara during PM peak hour (grams).
b. From 25 km^2 area containing downtown during PM peak hour (grams).
c. Derived by dividing 1979 emission density of 43 grams/second (see Table 7) by 3600.



a/End of year

Figure 21. Annual Carbon Monoxide Reductions from the Recommended Control Strategy

SECTION VI

THE BENEFITS OF CLEANER AIR

This section summarizes the benefits of controlling the Bay Area's major air pollutants, ozone and carbon monoxide. In general, controlling these two pollutants would provide benefits in three major areas:

- o improvements in public health
- o reduction in damage to vegetation
- o reduction in damage to other materials

The information on ozone and carbon monoxide summarized here, therefore, will cover their respective effects on each of these three areas. In addition, where such data are available, estimates of the present costs from failure to institute adequate control measures will be given. As progress is made in carrying out the plan, such adverse effects and their concomitant costs will be significantly reduced or eliminated, thus forming the benefits of the plan.

OZONE

Ozone has been shown to cause a wide range of deleterious effects on humans, vegetation and materials at ambient concentrations found in the Bay Area (0.19 ppm).

Effects on Human Health

Ozone causes a wide variety of health problems including irritation of the eyes and mucous membranes, impaired lung function and changes in the cellular composition of the lungs, increased susceptibility to infectious disease, biochemical imbalances in the lungs and other organs, rapid pulse, lowered blood pressure, cough, chest discomfort and a general decrease in human performance (EPA 1981). Exposure to ozone also aggravates conditions such as asthma, chronic bronchitis and emphysema, and thus may cause moderate to severe disability in a large high risk group (EPA 1981).

The following studies demonstrate more of the health effects specifically attributed to ozone exposure:

- o Statistically significant reduction in pulmonary function in nonsmokers and healthy smokers exposed to ozone at concentrations of .37 ppm, and possibly as low as .10 ppm (EPA 1978a);

- o Animal studies have demonstrated effects such as chromosomal damage, mutagenicity, morphological changes in the lung, altered enzyme activity and increased susceptibility, among others; humans may experience similar effects, although their likelihood is unknown at present (EPA 1978a);

- One study demonstrated thresholds of chest discomfort at .25-.29 ppm, cough at .30-.39 ppm and headache at .15-.19 ppm (EPA 1978a);

- Decreased ventilatory function in school children associated with ambient ozone concentrations from .10-.30 ppm; this is of additional concern for children due to the decrease in lung elasticity and overdistention demonstrated in animal studies (EPA 1978b);

- Impaired lung function and increased asthma attacks and other respiratory symptoms in high risk groups with short term exposures to .15 ppm - .25 ppm ozone (EPA 1978a);

- Eye irritation beginning at exposures to .10 ppm ozone and increasing with higher exposure (EPA 1981);

- Increased lysis of erythrocytes (destruction of blood cells) in healthy subjects exposed to .5 ppm ozone and intermittent light exercise (EPA 1978a);

- Statistically significant positive association between hourly ozone levels and frequency of automobile accidents in Los Angeles (possibly due to decreased visual acuity, visibility, eye irritation or performance impairment) (EPA 1978a).

Long term exposure effects from ozone are not as well known due to the long latency period for certain diseases (e.g. 20-40 years for lung cancer) whose effects may, therefore, not yet be detectable. However, it is apparent that short term exposure to ozone produces a variety of negative effects on human health, particularly to the aforementioned high risk groups. A single exposure of a sensitive individual (e.g. an asthmatic) may induce serious health effects; repeated exposures of even healthy individuals may lead to increased risk of respiratory impairment in the form of irreversible effects or susceptibility to chronic respiratory disease--such effects may occur at ozone levels as low as .15 - .25 ppm. (EPA 1978b).

Effects On Vegetation

Ozone is highly toxic to a variety of plants and, as it affects them, it potentially affects entire ecosystems. The economic losses nationwide due to vegetation damage from ozone and other photochemical oxidants was estimated in 1978 to be $300 million (EPA 1978c). The following studies demonstrate further the dramatic impact of ozone on vegetation:

- Studies of ozone in ambient air reported up to a 50% decrease in yield of citrus trees, a 10-15% decrease in grape yield followed by a 50-60% decrease the next year, a 5-29% decrease in yield of cotton lint and seed, losses of 50% in some sensitive potato, tobacco and soybean cultivars (plants), and a 30% decrease in wheat yield (EPA 1978a);

- o The threshold for effects from ozone on sensitive cultivars appears to be .05-.10 ppm (EPA 1979);

- o Foliar injury rates of only 5-10% (such rates are commonly exceeded in sensitive cultivars such as alfalfa, broccoli, spinach, petunia, etc.) could produce detectable reductions in growth or yield (EPA 1978c);

- o Significant growth and yield effects could occur if the average ozone concentration exceeds .05 ppm beyond 15 days (EPA 1978c);

- o Adverse effects of short term exposure to ozone have been noted as follows: trees and shrubs - .20-.51 ppm for 1 hr, .20-.25 ppm for 2 hrs, .06-.17 ppm for 4 hrs; agricultural crops - .20-.41 ppm for 1/2 hr; .10-.25 ppm for 1 hr, .04-.09 ppm for 4 hrs (EPA 1978a);

- o Certain crops, such as snapdragons and chrysanthemums, are no longer grown in the Bay Area due to air pollution, and many ornamental growers have been forced to move their operations out of the area (ABAG 1977);

- o Estimated losses to cut flower growers in the Bay Area in 1970 was approximately $1 million and has most likely increased (ABAG 1977).

It is clear that vegetation of all kinds are affected by levels of ozone air pollution in the Bay Area. The available data suggest damage to vegetation may range from several million dollars upwards to tens of millions of dollars. Reduction of ozone levels would have a significant impact on preventing such damage and costs.

Effects On Materials

As with humans and vegetation, ozone has negative effects on man-made materials. It has been shown to cause more rapid deterioration of rubber products, fading in textiles, carpets, clothes and paint dyes, and more rapid deterioration of fibers in many textile products.

The costs of such effects are high, and take two forms--the indirect cost of preventive measures, such as the addition of anti-cracking agents to tires, and the more direct cost to the consumer who must replace worn out materials earlier. For example, one study in 1970 estimated the nationwide economic impact of accelerated rubber aging (cracking) on the consumer to be $500 million-- $170 million in preventive agents added to the products and $330 million due to premature failure replacement costs (EPA 1978a). Further, if the national annual average concentration of ozone were reduced from .033 ppm to .026 ppm, it is estimated that there would be a savings, from rubber damage alone, of from $37-$61 million (EPA 1978a).

Locally, it is estimated that by the year 2000, all other factors being equal, Bay Area residents will pay between $12 and $39 million per year (in 1975 dollars) as a result of ozone damage to materials (ABAG 1977).

CARBON MONOXIDE

Carbon monoxide (CO) has been shown to have deleterious effects, such as those identified below, at the ambient levels found in the Bay Area (17 ppm) and thus are of concern.

Effects on Human Health

Briefly, CO displaces oxygen in the blood which, in turn, decreases the supply of oxygen to various parts of the body, particularly the cardiovascular and central nervous systems.

The specific effect CO has on humans depends both on its concentrations and the duration of exposure. Acute exposures to levels as low as 15-18 ppm have produced cardiovascular and nervous system effects such as decreased alertness, muscular incoordination, decreased learning ability and visual perception, changes in sleep patterns and decreased manual dexterity in healthy subjects (EPA 1979).

In addition, large segments of the population are at increased risk from CO exposure - such high risk groups include fetuses, persons with cardiovascular or nervous system conditions, sickle cell anemics, the young and the elderly, and people who use drugs (EPA 1979).

Table 1 summarizes some of the health effects from CO exposure, and other studies have demonstrated the following effects:

- Peripheral arteriosclerosis, diminished exercise capacity and intermittent claudication (lameness) in angina patients exposed to 15-18 ppm CO; the exacerbation of angina can result in more serious cardiovascular damage (EPA 1979);

- Dilation of coronary blood vessels after chronic exposure to 15-30 ppm CO; these vessels supply blood to the heart itself, and coronary damage or other vascular effects may result as the vascular system is forced to function beyond its capacity (EPA 1981);

- A 4-year study in Los Angeles showed a greater number of deaths when ambient CO concentrations were higher (EPA 1979);

- Animal studies have shown fetal abnormalities such as lower birth weight, slower postnatal weight gain, decreased brain protein levels and decreased activity levels in the first year after birth; the implications are clearly of concern to humans since the fetus under normal circumstances may be functioning at nearly critical tissue oxygen levels which even moderate CO exposure could upset, thus affecting development (EPA 1981);

- Prolonged low level exposure to CO may influence changes in circulating blood platelet counts and/or congenital platelet function disorders in man based on the results of animal experiments (Kalmaz, et al. 1980).

Although little is yet known about the interaction of CO with other pollutants, drugs and environmental conditions, the aforementioned studies demonstrate the importance of reducing current levels of ambient CO in the air in order to protect public health.

Effects On Vegetation

CO is a normal constitutent of the plant environment - many species are capable of absorbing and metobolizing CO photosynthetically, and some even function as net producers, emitting more than they absorb. It is therefore generally necessary to expose vegetation to atypically high levels of CO before deleterious effects are seen. One serious side effect on vegetation that has been noted is that chronic exposure to CO levels as low as 20 ppm may suppress the nitrogen-fixing bacteria in root nodules of legumes, or produce abnormal leaf formation in pea and bean seedlings.

Effects on Materials

To date there do not appear to be any studies or data on the effects of CO on other materials.

EFFECTS AND COSTS OF MULTIPLE POLLUTANTS

It should be noted that most of these data represent the effect of one pollutant alone, yet in the environment pollutants are found together and, since their combined effects can be additive or synergistic, the implications from these studies may represent underestimations of their true damaging potential.

For the purposes of estimating costs from pollution, however, most studies consider the combined effects of all air pollution constituents together. Two studies provide a general assessment of some of the less often quantified costs from failure to institute adequate pollution control:

- Increased hospitalization costs due only to exposure to ambient levels of air pollution in Allegheny County, Pennsylvania were found to be an estimated $ 9.8 million per year (Carpenter, et al. 1979);

- The annual health costs from pollution were estimated to be $250 for every family in the United States, suggesting that the costs of air pollution control are more than offset by the damages to public health from unabated air pollution (Ostro 1980);

- A survey performed by SRI International concluded that in the Bay Area the "willingness to pay" for a 30% improvement in visibility and health (related to air pollution) is estimated to be $85 million annually (SRI, 1981).

- A 1978 report by the President's Council on Environmental Quality estimated that, nationally, air pollution controls saved or prolonged approximately 14,000 lives, and saved approximately $21.4 billion compared to expenditures of $19 billion for air pollution controls in 1978 (Council on Environmental Quality 1978).

CONCLUSIONS

Despite the usual limitations and uncertainties data may hold, the evidence presented here makes it clear that ozone and carbon monoxide can temporarily or permanently damage or destroy human health and vegetation as well as man-made materials. The economic costs of such effects are enormous, probably reaching hundreds of millions of dollars in the Bay Area alone. But other costs are also borne, such as human costs from suffering, inconvenience, incapacitation and environmental costs from irreversible ecological damage, etc. The benefits of controlling ozone and carbon monoxide lie, therefore, in the reduction or elimination of such effects and costs--these are the benefits which will be obtained as this plan is carried out.

SECTION VII

FUTURE ACTIVITIES

POTENTIAL TRENDS

Future air quality in the Bay Area could well be affected by changes in society which may just now be emerging and are, therefore, not fully accounted for elsewhere in this update. For instance, shifts in regional growth patterns, in automobile technology, and even in lifestyles--especially in work and travel behavior--can have significant impacts. These phenomena may be influenced by social, economic and technological forces motivated by concerns other than improvement of air quality, but air quality may be affected nevertheless. The 1982 plan has emphasized strategies needed to meet short-term deadlines--attainment of ambient air quality standards by 1987. These programs will also help preserve the region's air quality over the longer term. However, continued growth in the Bay Area is expected as more people, jobs and industries are added to the region; air quality is likely to deteriorate and will eventually offset technological improvements in industrial and motor vehicle control systems. The lead time for implementing new air quality management strategies is fairly long. Actions that work to ensure long-term <u>maintenance</u> of air quality standards need to begin early. A vision of the future--and actions to affect the future--are needed if clean air is to be a reality in the year 2000 and beyond.

For the examples given below no emissions credits are being taken in this plan. These programs need to be carefully considered as part of a long term maintenance strategy. Many questions regarding financing and institutional responsibility need to be worked out. Most of these measures are "unenforceable" in the traditional sense, and deal more with basic lifestyle changes to improve air quality. To the extent that they occur it will be because of forces quite outside the control of the three co-lead air quality planning agencies. Nonetheless, illustrations of "just-over-the horizon" possibilities are outlined here so that the public and policy makers are well informed and better able to encourage these and other positive actions toward attainment and maintenance of satisfactory air quality. Hypotheses about potentially significant trends also help air quality planners to identify problems for future monitoring.

Examples:

1) The so-called "compact growth scenario" for regional development, studied for the 1979 AQMP but excluded as a set of control measures, may in fact be occurring to some degree. There is some evidence in the Bay Area of housing density increases along established transit routes within existing cities. This may be due to high costs of land for housing, efforts toward mitigating the regional housing shortage, high fuel and other travel costs, and open-space conservation efforts, among other motivations. It has led to zoning changes, density bonuses, infill development, urban renewal, and

"gentrification" of older areas. Correspondingly, there are also some recent projects and emerging plans for "mixed" land use development--including services, work-places and housing within single projects--and for industrial and commercial developments, e.g., large center-city headquartered corporations are relocating functional divisions near suburban, residential areas. To the degree that these newer trends counterbalance the traditional pattern of new housing located ever further from center-city workplaces, there should be a reduction in daily trips and in vehicle-miles-traveled (VMT) to work and to services. Studies now underway at ABAG and at MTC may demonstrate if, and to what degree, the region is moving toward a more "compact growth scenario."

A cautionary note seems appropriate. While compact growth should lead to a reduction in regional vehicle-generated emissions, overly dense development can exacerbate local problems. This is especially true for downtown areas where CO problems can be intensified if increased concentration of urban activities also results in increased traffic congestion.

2) More widespread use of cleaner fuels and/or alternative engines and vehicles (including electric) could have positive effects on air quality directly proportional to how much of the conventional fleet and travel use they replace. If there are breakthroughs in technology, in economic feasibility, and/or in consumer auto tastes, the impacts could be much greater than those estimated in the earlier TCM analysis.

3) Voluntary changes could occur in the living and working patterns of Bay Area residents with potentially significant impacts on air quality. In particular, work arrangements could be modified as a result of agreements between employers and employees in commercial and industrial firms, if both perceive the changes to be mutually beneficial.

Four voluntary maintenance measures described below share several common features: they are work-related; the air quality benefits occur through reductions of vehicle-miles-traveled and total daily trips; they reduce hydrocarbon (HC) and nitrogen oxides (NOx) in about equal amounts and so are inefficient ways to maintain (or attain) the ozone standard; they are most effective as carbon monoxide (CO) maintenance measures; and they have some benefit for maintenance of the present attainment status of NOx and of particulates.

Most transportation control measures (TCMs) have similar characteristics, but the following measures are not considered to be true TCMs. These measures complement the land use measures previously described.

- Compressed Work Week - A monitored Denver experiment indicates that a voluntary, four-day work week could reduce both work-trips and non-work trips. According to estimates based on studies made for the U.S. Department of Transportation (USDOT, 1981), total VMT could be reduced by as much as 6 percent if such work arrangements were to become widespread.

  Difficulties with this measure are: not all firms have found this measure satisfactory after trying it; management must implement carefully planned scheduling; and productivity must not suffer. Air quality benefits are achieved only if the work-related travel is not replaced by an equal or greater amount of non-work-related travel.

- Flex-Time - This program is most useful for reducing automobile congestion. It has also been demonstrated in certain cases to increase transit use. Peak travel periods of crowded transit vehicles can be reduced. Also, car and van-pooling have been shown to increase due to flex-time. The achievable percent reduction in journey-to-work VMT on a voluntary basis is unknown.

- Work-at-Home - Great changes are occuring now and will continue to occur in communication and computing networks. Computing power is being widely distributed in ever cheaper devices. These technological changes could allow some workers to perform their assigned jobs without leaving home. The potential effect is, again, to reduce the journey-to-work VMT. The word "telecommuting" has been suggested to describe this scenario. The achievable percent reduction in journey-to-work VMT is not identifiable. If 5 percent of the work force were working at home at least half of the time, the total VMT could be reduced by almost one percent.

  Difficulties with this measure are: management must implement carefully planned scheduling; productivity must not suffer; and many workers appear to prefer the social and professional interaction of the group work place.

TRAVEL MONITORING SYSTEM

A system for monitoring trends in regional travel is being developed to determine if the growth in travel is consistent with that assumed in the Air Quality Plan. The mobile source emissions inventories are based on travel simulations for the years 1979 and 1987. The transportation controls which are adopted will reduce vehicular travel from these baseline projections. Figures 22 and 23 show the growth in vehicle trips and vehicle-miles-traveled (VMT) for the baseline and for the control alternative.

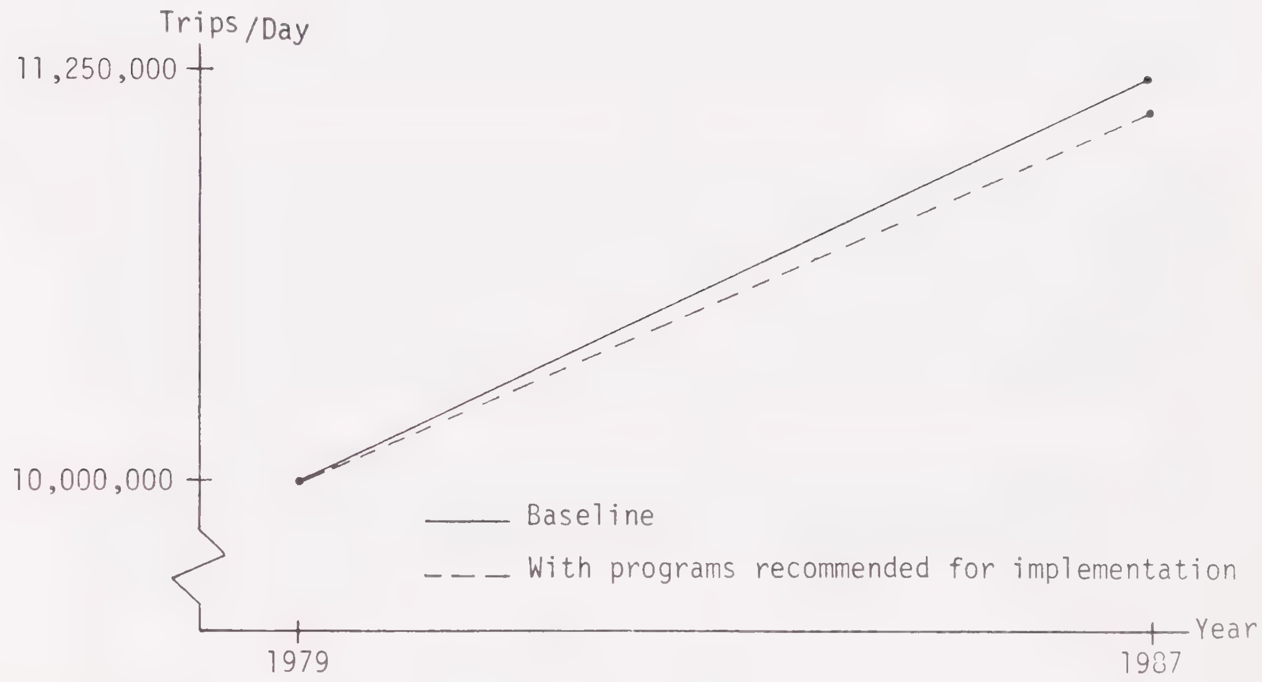


Figure 22. Vehicle Trips in Bay Area: Non-Commercial Travel

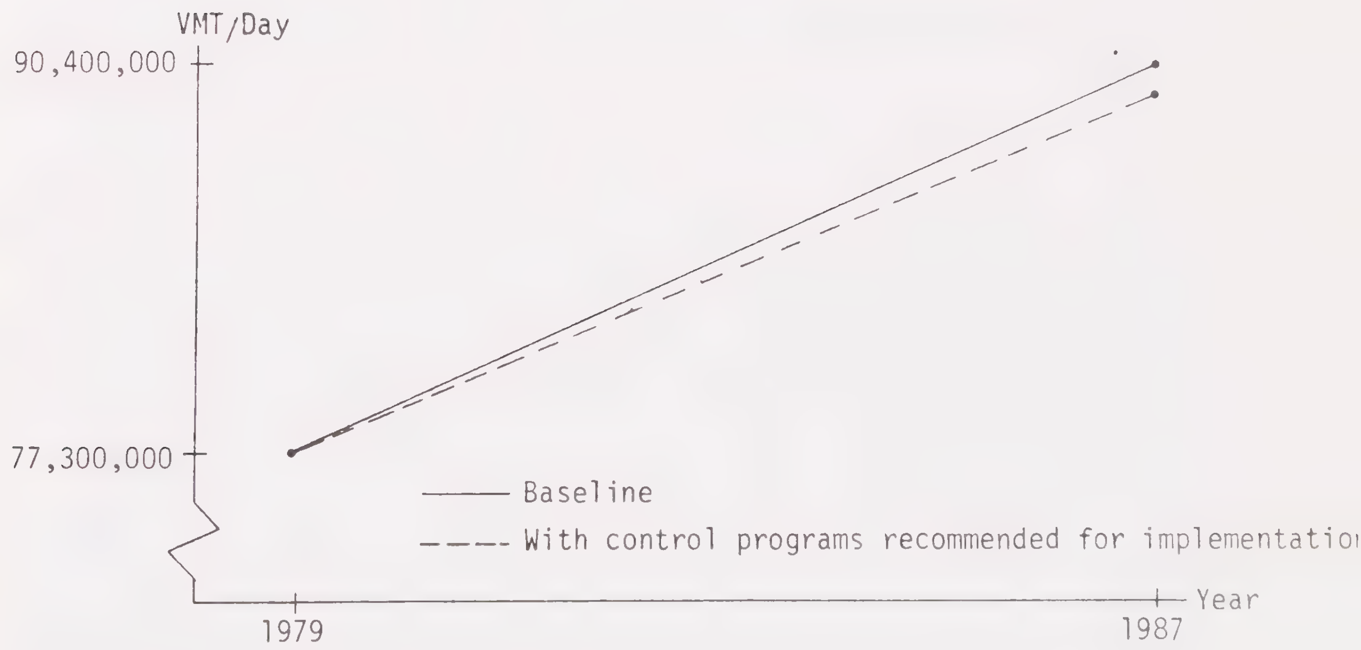


Figure 23. VMT in Bay Area: Total Travel

Ideally, one would like to collect sufficient travel data to be able to assess the effectiveness of the individual transportation controls. However, it would be quite expensive to collect such data. Accordingly, MTC will continue to include in the annual air quality reports data which is normally collected on auto occupancies, transit ridership, number of carpools, etc. Together, these give an indication of general trends, but cannot be used to assess individual transportation measures.

MTC investigated the feasibility of developing an annual estimate of regional VMT to compare with the assumed growth shown in Figure 22. It was determined that substantial new data would need to be collected to develop a regional VMT estimate that was sufficiently accurate to detect the small changes in VMT that would occur because of growth or the implementation of the TCMs. It is instead proposed that a comparison be made between the growth rate projected in the baseline VMT and the traffic growth measured in an ongoing Caltrans program.

Caltrans currently collects traffic data at 11 permanent count stations in the Bay Area. The data is summarized in a report issued quarterly. The VMT baseline growth rate between 1979 and 1987 is 2.1% per year. Caltrans has recorded the following traffic growth at their 11 permanent stations:

1979-80	0%
1980-81	3.8%

Since the 3.8% traffic growth in the two years was below the baseline projection for 2 years (4.2%), the emissions would be within the Reasonable Further Progress line.

This comparison will continue to be reported in the Annual Air Quality Report.

ANNUAL AIR QUALITY REPORTS

Annual air quality reports are prepared in response to Sections 171, 172 and 173 of the 1977 Clean Air Act Amendments, and in response to annual report requirements issued by the U.S. Environmental Protection Agency and the California Air Resources Board. Their purpose is to provide the public and regulatory agencies with a progress report on the effectiveness of air pollution control programs in reducing both emissions and ambient levels of air pollutants in the Bay Area.

The goal of the 1982 Bay Area Air Quality Plan is to achieve ambient air quality standards in the Bay Area by 1987 by controlling pollutant emissions. Assessing the effectiveness of control programs on an annual basis will identify successes or failures of the programs in meeting the goal of the 1982 Plan. If emissions are not decreasing at rates that will allow standard attainment by 1987, then further controls must be adopted and implemented.

Thus, the annual reports will serve as the principal vehicle for determining needs, evaluating options, and amending the plan. Future annual reports will include the following items:

- o Updated emission inventories and emission inventory projections;
- o Updated assessments of ambient air quality in the preceding year and developing trends;
- o Updated assessments of demographic and economic trends which affect air quality in the Bay Area;
- o Results from a regional travel monitoring system designed to track trends in vehicular travel in the Bay Area;
- o Review of progress in implementing the control programs adopted in the 1979 and 1982 Bay Area Air Quality Plans;
- o Review of changes in the specification of reasonably available control technology (RACT) and best available control technology (BACT) for various source categories;
- o Updates on the Air Resources Board's suggested control measure (SCM) process, and the applicability of such SCMs to the Bay Area;
- o Review of new State and federal regulations pertaining to the plan or to sources affected by the plan, as needed;
- o Assessment of whether "reasonable further progress" toward attainment of federal air quality standards was achieved during the previous year.

Future funding for this activity is uncertain, and the depth of coverage of each of these items will vary depending on the resources that can be made available for this purpose.

1984 PLAN UPDATE

In addition to the preparation of annual reports, both the Bay Area Air Quality Management District and the Association of Bay Area Governments have committed to preparing an update of the Plan by October 1984. By that time, it is expected that more specific information will be available on the effectiveness of I/M and the adopted stationary source transportation controls, as well as on the impact of the control program on ozone levels in neighboring air basins.

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APPENDIX A

STATIONARY SOURCE CONTROL MEASURES

Revised 10/6/82
12/7/82

PROPOSED CONTROL MEASURE - #1

CONTROL MEASURE NAME: **Organic Chemical Manufacturing**

EMISSION ESTIMATES:

BAAQMD Inventory:	1979	1987	
#19 Other Chemical Mfgr.	0.8	0.6	Tons/Day
Current Estimate	0.8	0.6	
Subject to Control	0.5	0.5	
Potential Reduction	--	**0.3**	

COST EFFECTIVENESS: **$500/ton**

REACTIVITY: **low**

YEAR OF ADOPTION: **1986**

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction	0	0	0	0	0.2	0.3	Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Fugitive emissions from organic chemical manufacturing plant valves and flanges are presently regulated by Regulation 8 Rule #22. This Rule will affect approximately 10 chemical plants with a total of 2,000 sources which must meet a leak detection and repair program (quarterly monitoring) with an action level of 10,000 ppm (expressed as methane). These sources are primarily process vessel depressuring, pressure relief valve leaks, compressor seal leaks and pump seal leaks.

PROBABLE METHOD OF CONTROL:

Install vapor recovery plant for process vessel vents and easily manifolded relief valve vents or an alternative of manifolding all vents to an existing furnace (or incinerator) or flaring. Install rupture disks in place of relief valves, or upstream of relief valves; use pilot-operated relief valves to reduce leakage. Use continuous surveillance (temperature, infrared, etc.) to detect leaks. Pump seals will be retrofitted with dual seals (with barrier fluid and degassing systems). Compressor seals will be retrofitted for degassing vents to the compressor.

OTHER IMPACTS:

Increased energy use if incineration used.

COMMENTS:

Fugitive emissions from refinery organic chemical plant sources (process vessel depressurization, valves and flanges, pumps and compressors, and pressure relief valves) will continue to be regulated by existing Regulation 8 - Rules 10, 18, 25 and 28.

PROPOSED CONTROL MEASURE #2

CONTROL MEASURE NAME: **General Solvent and Surface Coating Operations**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#61 Industrial Coating-Hi Solv.	73.7	15.3	Tons/Day
#62 Lo Solv.	1.5	26	
Current Estimate	"	"	
Subject to Control	--	--	
Potential Reduction	--	**1.5**	

COST EFFECTIVENESS: **$6,000/ton**

REACTIVITY: **varies, generally high**

YEAR OF ADOPTION: Contingency Measure

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction							Tons/Day

DESCRIPTION OF CONTROL MEASURE:

The control measure would affect major source operations that emit greater than 600 lbs/day of precursor organic compounds. Proposed measure will set an emissions cap for major sources. This emission cap will vary according to source operation: 3000 lb/day and 450 lb/hr for sources subject to Rule 13, 1320 lb/day and 220 lb/hr for aerospace operations, 600 lb/day and 81 lb/hr for all other sources. Proposed measure will affect all source operations covered by existing rules. Affected sources are principally general painting operations plus auto lines and film coaters.

PROBABLE METHOD OF CONTROL:

Measure will require reformulation of coating materials by the coating manufacture industry. Where industry is currently using low solvent coatings incinerators may be required.

OTHER IMPACTS:

Increased energy use if incinceration required.

PROPOSED CONTROL MEASURE #3

CONTROL MEASURE NAME: **Letterpress/Offset Printing**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#77 Other Printing	6.4	5.7	Tons/Day
Current Estimate	"	"	
Subject to Control	--	5.0	
Potential Reduction	--	**3.0**	

COST EFFECTIVENESS: **$1800/ton**

REACTIVITY: **medium**

YEAR OF ADOPTION: **1985**

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction	0	0	0	1.0	2.0	3.0	Tons/Day

DESCRIPTION OF CONTROL MEASURE:

This rule will affect approximately 100 locations and 400 sources of letterpress and offset printing operations within the District. This rule will be similar to existing rules governing other types of printing operations (i.e. rotogravure, flexograph).

PROBABLE METHOD OF CONTROL:

1. Refrigeration/Condensation: involves the chilling of the air and condensing the organic out. An uneconomical option due to the large volume of air that would have to be chilled; system would have to be large and therefore, expensive.
2. Carbon Adsorption: involves passing the air from the presses through carbon beds that would remove the organics. An uneconomical option due to the many carbon beds that would be required to handle the large air volumes and the subsequent regeneration of this carbon on a frequent basis.
3. Incineration: involves passing the air through a high temperature incincerator, or a catalyst. Most economical option because incinerators easily handle large volumes of air. Ducting the air to the incinerator can be achieved in one of two ways: 1) hooding each press and sucking the air up into a ducting system, or 2) floor scoops that would direct the heavier, solvent vapor laden air to a ducting system that leads to an incinerator.

OTHER IMPACTS:

Increased energy use.

COMMENTS:

Control Measure #3 has been moved from contingency list to reasonably available list, due to lowering planning assumption on I&M effectiveness. Will be re-evaluated during the 1984 AQMP update.

P R O P O S E D   C O N T R O L   M E A S U R E   # 4

CONTROL MEASURE NAME: **Natural Gas and Crude Oil Production & Processing**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#40 Oil & Gas Field Operations	2.3	2.5	Tons/Day
Current Estimate	"	"	
Subject to Control	2.3	2.5	
Potential Reduction	--	**1.6**	

COST EFFECTIVENESS: **$750/ton**

REACTIVITY: **low**

YEAR OF ADOPTION: **1986**

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction	--	--	--	--	.8	1.6	Tons/Day

DESCRIPTION OF CONTROL MEASURE:

This Rule will affect approximately twenty locations and 1,000 sources of gas/crude oil process/production operations in Solano, Contra Costa and Alameda Counties. The Rule will be similar to refinery rules that control fugitive emissions, process vessels and storage tanks. Fugitive emission sources must meet a leak detection and repair program (quarterly monitoring) with an action level of 10,000 ppm (expressed as methane). These sources are process vessel depressuring, pressure relief valve leaks, compressor seal leaks and pump seal leaks. A few organic storage tank greater than or equal to 37.5 m^3 (10,000 gals.) will require organic emission control of 95% by weight.

PROBABLE METHOD OF CONTROL:

Install vapor recovery plant for process vessel vents and easily manifolded relief valve vents <u>or</u> an alternative of venting emission to a certified flare or incinerator. Pump seals will be retrofitted with dual seals (barrier fluid & degassing system). Compressor seals will be retrofitted for degassing vents to the compressor. All storage tanks greater than or equal to 27.5M^3 (10,000 gals.) and greater than or equal to 0.33 BAR (0.5 psia) will require floating roof & two seals or vapor recovery of 95% by weight or any alternative that can be proved to meet 95% (wt.) control.

OTHER IMPACTS:

PROPOSED CONTROL MEASURE #5

CONTROL MEASURE NAME: **Polymer and Resin Manufacturing**

EMISSION ESTIMATES:

BAAQMD Inventory:	1979	1987	
#19 Other Chem. Mfgr.	0.8	0.6	Tons/Day
57 Storage Tanks-Solv.	1.6	1	
58 Storage Tanks-Other	1.8	2	
66 Coatings Mfgr.	0.7	0.7	
Total	4.9	4.3	
Current Estimate	"	"	
Subject to Control	0.5	0.5	
Potential Reduction		**0.2**	

COST EFFECTIVENESS: **$1600/ton**

REACTIVITY: **medium**

YEAR OF ADOPTION: **1986**

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction						0.2	Tons/Day

DESCRIPTION OF CONTROL MEASURE:

With the exception of fugitive emissions, much of the control equipment used in this industry is a basic part of the system and serves to recover a reactant or product. These controls include floating roof tanks or vapor recovery systems on volatile material, storage units, adsorption or condensers, purge lines that vent to a flare system, and recovery systems on vacuum exhaust lines. Fugitive emissions such as process vessel depressuring, pressure relief valve--compressor seal and pump seal leaks must meet a leak detection and repair program (quarterly monitoring) with an action level of 10,000 ppm (expressed as methane). Approximately 25 locations with approx. 70 sources will be affected by this rule.

PROBABLE METHOD OF CONTROL:

Storage tanks of greater than or equal to 37.5 m^3 (10,000 gals) and greater than or equal to 0.033 bar (0.5 psia) will require floating roof and two seals or vapor recovery of 95% by weight or any alternative that can be allowed to meet 95% (wt.) control of organic emissions. Install vapor recovery units for process vessel vents and easily manifolded relief valves <u>or</u> an alternative of venting emission to a certified flare or incinerator. Pump seals will be retrofitted with dual seals (barrier fluid and degassing systems). Compressor seals will be retrofitted for degassing vents to the compressor. Truck loading racks and drum filling station vent emissions should be 95% (wt.) controlled by carbon adsorber, direct flame afterburner or flared. Exempt any process vent that emits smaller than or equal to 5 kg (11 lbs.) of organic material per day.

OTHER IMPACTS:

Increased energy use if incineration is used.

Revised 10/6/82
12/6/82

PROPOSED CONTROL MEASURE - #6

CONTROL MEASURE NAME: **Wood Furniture Coating**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#61 Industrial Coating	72.0	15.3	Tons/Day
Current Estimate	73.7	15.3	
Subject to Control	2.0	2.2	
Potential Reduction	--	**1.1**	

COST EFFECTIVENESS: **$500/ton**

REACTIVITY: **medium**

YEAR OF ADOPTION: **1985**

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction					0.5	1.1	Tons/Day

DESCRIPTION OF CONTROL MEASURE:

This measure is intended to reduce the VOC emissions from furniture coating operations by at least 50%. About five major companies with approximately 25 sources would be affected. Small business with emissions less than 20 lb/day would be exempt.

PROBABLE METHOD OF CONTROL:

Three methods of reducing VOC emissions from wood furniture coating operations are:

A. Electrostatic spraying employing high voltage to electrically charge atomized material leaving spray gun, and wood surface made conductive so that it can be grounded. This technology has been used successfully for spraying wood chairs and is now proposed for case goods (i.e. cabinets, tables and desks).

B. Waterborne coatings using binder or resin that is miscible in a water & organic solvent mixture.

C. Combustion of VOC emissions in an incinerator may not be practical from an energy and equipment cost considerations.

Waterborne coatings will be substituted for low to medium solvent coatings. Higher solvent coatings would require 50 to 60% transfer ratios--(electrostatic spraying can also improve transfer efficiencies). Halogenated solvents could be substituted for more reactive solvents presently used.

OTHER IMPACTS:

Possible water pollution from water borne coatings. Increased energy use if incineration used.

Revised 10/6/82
12/6/82

PROPOSED CONTROL MEASURE - #7

CONTROL MEASURE NAME: **Volatile Organic Waste Disposal**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#11 Other Processes	5.7	4	Tons/Day
#42 Land Farming	3	3	
#44 Other Industrial/Commercial	2.7	3	
#81 Other Organics Evaporation	14.7	10.9	
Total	26.1	20.9	
Current Estimate	"	"	
Subject to Control	8	8	
Potential Reduction	--	**6**	

COST EFFECTIVENESS: **$2400/ton**

REACTIVITY: **variable**

YEAR OF ADOPTION: **1984**

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction	0	0	0	1	3	6	Tons/Day

DESCRIPTION OF CONTROL MEASURE:

This measure would apply to any person who generates, stores, transfers, treats or disposes of volatile organic wastes. It would prohibit mixing wastes in such a manner that would render the waste unsuitable for recycling or recovery, require the waste to be stored in covered containers, and require submerged filling or bottom loading during transfer operations. It would prohibit ponding or land spreading of wastes containing greater than 1% VOC as defined by a vapor pressure or distillation test. It would also require persons generating more than 2000 kilograms/month to have a District approved volatile organic waste control plan.

PROBABLE METHOD OF CONTROL:

This measure would encourage recycling and recovery of waste solvents, thus minimizing quantities disposed of in Class I dump sites. Class I sites would have to pretreat wastes with greater than 1% volatile organic wastes before the waste could be disposed of in ponds or by other land disposal methods. Some wastes might be transported outside the District and/or incinerated.

OTHER IMPACTS:

Use of incineration would result in increased energy consumption, and would produce additional emissions of NOx, SOx, and particulate matter. It is anticipated that some useful heat may be recovered from these incineration process.

COMMENTS:

On September 23, 1982 the CARB approved a Suggested Control Measure to reduce organic compound emissions associated with volatile organic waste disposal. The proposed date of adoption is January, 1985. Test methods are under study by the Technical Review Group.

PROPOSED CONTROL MEASURE - # 8

CONTROL MEASURE NAME: **Consumer Solvents (formerly Aerosol Cans)**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#80 Consumer Solvent Usage	41.7	45.3	Tons/Day
#36 Pesticides (All)	8.5	9.2	
Total	50.2	54.5	
Subject to Control:			
#80 Consumer Solvent Usage	41.7	45.3	
#36 Pesticides (Domestic)	1.5	1.6	
Potential Reduction	--	**4.0**	

COST EFFECTIVENESS: **$500/ton**

REACTIVITY: **low to medium**

YEAR OF ADOPTION: **1985**

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction	0	0	0	1	2	4	Tons/Day

DESCRIPTION OF CONTROL MEASURE:

This control measure proposes to reduce emissions by lowering the reactive organic content of consumer products, wherever possible. The goal is to reduce organic solvent content on a product-by-product basis; certain products could be exempted.

PROBABLE METHOD OF CONTROL:

It is envisioned that consumer products could be reformulated to reduce or eliminate the use of reactive organic diluents, solvents, carriers and propellants. Consumer products will be studied on an item-by-item basis to ascertain which can be reasonably changed to reduce emissions on a cost effective basis. Allowable reactive organic content limits would be set on a product specific basis for those consumer products determined feasible to control.

OTHER IMPACTS:

Manufacturers may not be able to design their products just for the Bay Area or California markets. Some products may not be available in all packaging forms, decreasing consumer choice. Offsetting these impacts, lower reactive organic usage in consumer products should result in cost reductions for the manufacturers and savings for the consumers.

COMMENTS:

There is continuing economic incentive to reduce the use of relatively expensive organic solvents and propellants in consumer products in the interest of lower product cost. Some products have already been converted from organic base to water base for economic and safety reasons, with a substantial reduction (50%) in organic emissions. Some products cannot use a water base formulation because of incompatibility with active ingredients. A communication from ARB states the technology regarding aerosol paint cans is evolving towards 75% control, and should be available by 1987. This technology could provide a 4.5 ton/day reduction in organic emissions from this product line alone. Carbon dioxide pressurized pouch inserts also appear to have promise for replacing hydrocarbon in some products.

Revised 10/6/82

PROPOSED CONTROL MEASURE #9

CONTROL MEASURE NAME: **Marine Lightering**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#79 Lightering, Marine Transfer	4.5	4.1	Tons/Day
Current Estimate	7	7	
Subject to Control		4	
Potential Reduction		**0.6**	

COST EFFECTIVENESS: **$1000/ton**

REACTIVITY: **low**

YEAR OF ADOPTION: Contingency Measure

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction							Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Under study.

PROBABLE METHOD OF CONTROL:

Under study.

OTHER IMPACTS:

Under study.

COMMENTS:

Control Measure #9 has been moved to the bottom of the contingency list because of concerns with technical feasibility and jurisdiction. CARB is preparing a report to the state legislature which will address these issues and related problems with control measure #10. Measure #9 will be reconsidered during the 1984 AQMP update.

Revised 10/6/82

PROPOSED CONTROL MEASURE #10

CONTROL MEASURE NAME: **Ship, Barge, Tanker & Railcar Loading**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#48 Loading	3.1	3.42	Tons/Day
Current Estimate			
Subject to Control			
Potential Reduction		3	

COST EFFECTIVENESS: **$2-7000/ton**

REACTIVITY: **medium**

YEAR OF ADOPTION: Contingency Measure

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction							Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Require 90% control of loading emissions. Low volume and low vapor pressure loading may be exempted.

PROBABLE METHOD OF CONTROL:

Condensation, vapor balance, incineration technology similar to the loading of gasoline trucks at bulk terminals.

OTHER IMPACTS:

Safety considerations are important. Other agencies, such as Coast Guard, may have jurisdiction.

COMMENTS:

Control of railcar loading emissions costs about $10,000/ton. EPA dismissed proposals to control tank car loading because only 1 car in 10 carried VOC liquids on previous load. Operators who do not have dedicated fleet may not be able to comply with marine control requirements.

Revised 12/6/82

PROPOSED CONTROL MEASURE #11

CONTROL MEASURE NAME: **Gasoline Distribution**

EMISSION ESTIMATES:

BAAQMD Inventory:	1979	1987	
#54 Filling Station Storage Tank	6	5.1	Tons/Day
#55 Filling Sta. Vehicle Tank	6.4	5.5	
Total	12.4	10.6	
Subject to Control		1.1	
Potential Reduction		**1.0**	

COST EFFECTIVENESS: **$500/ton**

REACTIVITY: **low**

YEAR OF ADOPTION: **1985**

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction	0	0	0	0	1	1	Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Regulation 8 Rule 6-111 will be more stringent, effective 1/1/83, to reduce the number of exempted trucks and bulk plants. This measure would modify 8-7-110.5 to require vapor recovery equipment at retail service stations previously exempted because they were serviced exclusively by bulk plants with a throughput below 6 million gallons per year.

PROBABLE METHOD OF CONTROL:

Installation of vapor balance systems on 112 stations now claiming exemptions.

OTHER IMPACTS:

Capital cost requirements may be burdensome on small station operators.

P R O P O S E D   C O N T R O L   M E A S U R E   # 1 2

CONTROL MEASURE NAME: **Architectural Coatings**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#60 Structures Coating-Low Solv.	14.4*	24*	Tons/Day
Current Estimate	"	"	
Subject to Control		10	
Potential Reduction		1**	

COST EFFECTIVENESS: **$1500/ton**

REACTIVITY: **medium**

YEAR OF ADOPTION: Contingency Measure

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction							Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Control measure would reduce the solvent content limit for flat coatings from 250 grams per liter to 125 grams per liter in Regulation 8 - Rule 3. Possible exemption for certain types of paint.

PROBABLE METHOD OF CONTROL:

Most reduction of organic emissions will be by substituting latex-type coatings for low solvent flat paints. The remaining reductions will be achieved by reformulation of low solvent flat paints from 250 to 125 grams per liter.

OTHER IMPACTS:

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*Inventory based on 0.5 lb solvent per gallon. Usage rate based on BAAQMD survey (1976). South Coast/CARB survey found use rate substantially lower, update in process.

**Potential reduction is small because present flat paints average about 135 grams/liter.

Revised 12/6/82

PROPOSED CONTROL MEASURE #13

CONTROL MEASURE NAME: **VOC Storage**

EMISSION ESTIMATES:

BAAQMD Inventory:	1979	1987	
#47 Refinery Storage & Blending	12.2	12.5	Tons/Day
#50 Bulk Plant Storage	1.5	.9	
#57 Solvent	1.2	1.0	
#58 Other Organics	1.8	2.0	
Total	16.7	16.4	
Subject to Control		12	
Potential Reduction		3	

COST EFFECTIVENESS: **$275-1500/ton**

REACTIVITY: **varies**

YEAR OF ADOPTION: **1985**

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction	0	0	0	.7	1.5	3	Tons/Day

DESCRIPTION OF CONTROL MEASURE:

The control measure would affect tanks larger than 40,000 gallons that contain a stock cut between 0.5 psia and 1.5 psia and tanks larger than 10,000 gallons containing stock greater than 1.5 psia. The first grouping would primarily impact tanks at refineries. The second grouping would have impact at marketing bulk plants and organic solvent storage facilities. There are few refinery tanks in the second category.

PROBABLE METHOD OF CONTROL:

The use of secondary seals on larger tanks would be the most effective and economical means on FR tanks. On cone roof tanks an internal floating roof would be the most economical means unless a vapor recovery system was already in place.

OTHER IMPACTS:

Installation of internal roof requires tank cleaning and disposal of hazardous bottoms.

COMMENTS:

Cost of control on small tanks (10,000 to 40,000 gal.) is much higher, about $4,000/ton reduction.

PROPOSED CONTROL MEASURE #14

CONTROL MEASURE NAME: **Automobile Refinishing**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#63 Other Coating-High Solvent	19	20	Tons/Day
Current Estimate	19	20	
Subject to Control	--	13	
Potential Reduction	--	**5.2**	

COST EFFECTIVENESS: **$2,800/ton**

REACTIVITY: **medium**

YEAR OF ADOPTION: **1984**

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction	0	0	0	1	3	5.2	Tons/Day

DESCRIPTION OF CONTROL MEASURE:

This measure would affect refinishing of worn or damaged autos, light trucks and other vehicles using lacquers and enamels sprayed in paint booths or in the open. This Rule will require enclosure of painting area, lower solvent lacquers and enamels and/or alternate control methods to achieve 50 to 90% emission control on the effluent stream.

PROBABLE METHOD OF CONTROL:

Install totally enclosed paint spray booths equipped with paint arresters, water curtains and/or incineration/adsorption/electrostatic control systems to obtain 90% emission control of non-methane hydrocarbons on sources emitting greater than or equal to 15 lb/day of total organic compounds. Sources (spray guns) greater than or equal to 15 lb/day will require use of low solvent lacquers and enamels at less than or equal to 350 grams of VOC per liter of coating. Overall control, as shown above, is expected to be about 40%.

OTHER IMPACTS:

Low solvent paint may be less durable.

COMMENTS:

Control measure #14 has been moved from contingency to reasonably available list due to lowered planner assumption of I&M effectiveness. It will be re-evaluated during the 1984 AQMP update.

PROPOSED CONTROL MEASURE - #15

CONTROL MEASURE NAME: **Pesticides**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:	**1979**	**1987**	
#36 Pesticides	8.4	9.2	Tons/Day
Current Estimate	"	"	
Subject to Control	3.8	4.2	
Potential Reduction		**3.7**	

COST EFFECTIVENESS: **$400/ton**

REACTIVITY: **low**

YEAR OF ADOPTION: **1984**

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction	0	0	1	1.8	3.3	3.7	Tons/Day

DESCRIPTION OF CONTROL MEASURE:

This control measure would affect the industrial, commercial, and institutional uses of pesticides by encouraging the use of existing synthetic pesticides; discourage or prohibit the use of non-synthetic pesticides; ban the use of weed oil. Domestic usage of home garden-type pesticides are excluded in this proposed control measure. Such pesticide products are considered in Proposed Control Measure #8, Consumer Solvents.

PROBABLE METHOD OF CONTROL:

Reformulation of existing products to synthetic pesticides. Eliminate the use of weed oil.

OTHER IMPACTS:

ARB has created a task force to study control of pesticide emissions. Reformulation of existing non-synthetic pesticides can result in synthetic pesticides that may be more hazardous than the reactive organics they replace. Calif. Admin. Code (Title 3, Section 2445) requires county agricultural commissioners to consult with agencies having jurisdiction over resources affected by pesticide use.

COMMENTS:

Emissions estimate may be too high because underlying studies (Eureka Lab & Weins Report) have been challenged. Work is currently underway by the ARB pesticide task force and U.C. Davis to determine the quantity of petroleum oils being used in California and their degree of volatility.

PROPOSED CONTROL MEASURE - #16

CONTROL MEASURE NAME: **Wineries**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#33 Wineries	0.3	0.3	Tons/Day
Current Estimate	"	"	
Subject to Control		0.2	
Potential Reduction		**0.1**	

COST EFFECTIVENESS: **$2000/ton**

REACTIVITY: **low**

YEAR OF ADOPTION: Contingency Measure

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction							Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Control measure would affect ethanol emissions resulting from the fermentation process. Control requirements should be focused on the larger operations and/or tanks, with exemptions based on size.

PROBABLE METHOD OF CONTROL:

Due to the nature of the process, the volume of effluent gases to be processed should be relatively small. Large tanks could be manifolded together and ducted to a single control system, employing condensation or absorbtion.

OTHER IMPACTS:

COMMENTS:

Wineries are currently exempt from permit requirements. Because of the low emissions, low reactivity, and the remote location of most wineries, this measure is unlikely to offer much potential for ozone reduction. ARB has contracted EAL Research Lab.to do literature and field studies; report expected soon.

PROPOSED CONTROL MEASURE - #17

CONTROL MEASURE NAME: **Coatings Manufacturing**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#66 Coatings Manufacture	0.7	0.7	Tons/Day
Current Estimate	"	"	
Subject to Control		0.7	
Potential Reduction		**0.2**	

COST EFFECTIVENESS: **$2000/ton**

REACTIVITY: **low**

YEAR OF ADOPTION: **1986**

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction	0	0	0	0	0	0.2	Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Require 95% control, by weight, of organic emissions from tanks, process vessel vents 5 kg (11 lbs.) per day, relief valves, truck and drum filling, and vacuum exhaust. Decrease fugitive emissions by improved vigilence and maintenance. Fugitive emissions such as process vessel depressuring, pressure relief valves, compressor seal and pump seal leaks must meet a leak detection and repair program (quarterly monitoring) with an action level of 10,000 ppm (expressed as methane). Approximately 20 locations with a total of 60 sources would be affected by this rule.

PROBABLE METHOD OF CONTROL:

Much of the control equipment used in this industry is a basic part of the process and serves to recover a reactant or product. These controls include floating roof tanks or vapor recovery systems on volatile material storage units, adsorption or condensors, purge lines that vent to a flare system, and recovery systems on vacuum exhaust lines. Storage tanks greater than or equal to 37.5 m^3 (10,000 gallons) containg organic liquid greater than or equal to 0.033 bar (0.5 psia) will require double seal floating roofs or vapor recovery or any alternate that can be shown to meet 95 wt.% control of organic emissions. Install vapor recovery units for process vessel vents, truck loading and drum filling stations, and easily manifolded relief valves or an alternate of venting emissions to a certified flare or incinerator at 95 wt.% control. Pump seals will be retrofitted with dual seals (barrier fluid and degassing systems). Compressor seals will be retrofitted for degassing vents to the compressor.

OTHER IMPACTS:

PROPOSED CONTROL MEASURE - #18

CONTROL MEASURE NAME: **Lawnmowers**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#104 Recip. Eng., Lawnmowers	5.6	4.2	Tons/Day
Current Estimate			
Subject to Control	1.5	0.3	
Potential Reduction		**0.1***	

COST EFFECTIVENESS: **little or no cost to consumer; use $200/ton**

REACTIVITY: **high**

YEAR OF ADOPTION: Contingency Measure

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction							Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Ban the sale of new 2-stroke gasoline engine lawnmowers as of January 1, 1984. All mowers sold after that date would have to be electric, 4-stroke gasoline, or push-type. Require fixed (instead of variable) main jet on new 4-stroke engines.

PROBABLE METHOD OF CONTROL:

Replacement of high-emitting 2-stroke mowers with low-emitting models. Emissions from existing 2-stroke mowers will be reduced as the older mowers wear out and are subsequently replaced by either electric or 4-strokes. This replacement is occuring now, without regulation, and any new control measure will have a small effect on emissions. About 5% of existing mowers have 2-stroke engines. Most new units are electric or 4-stroke. Organic emissions from one 2-stroke are equal to emissions from eight 4-strokes. Thus replacement of each 2 stroke will reduce that emission by more than 88%.

OTHER IMPACTS:

ARB responsibility for hardware controls on 4-stroke engines, for reasons of precedent, expertise and statewide uniformity.

ALTERNATIVE CONTROL MEASURE #18-B: ***** NOT REASONABLY AVAILABLE *****

Ban use of gasoline-powered mowers on ozone daysof high ozone potential; 8 T/Day reduction.

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*Note that summer day emission reductions would be approximately twice the annual average daily reductions.

PROPOSED CONTROL MEASURE - #19

CONTROL MEASURE NAME: **Reciprocating Engines** (Gasoline-Fueled)

EMISSION ESTIMATES:

BAAQMD Inventory:	1979	1987	
#105 Other Gasoline Engines	11.4	13.2	Tons/Day
#106 Gas Fueled Engines	3.3	3.4	
#107 Oil Fueled Engines	0.1	0.1	
Cumulative Total	14.8	16.7	
Subject to Control	14.7	16.6	
Potential Reduction		**4.0**	

COST EFFECTIVENESS: **unknown**

REACTIVITY: **high**

YEAR OF ADOPTION: 1984

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction	0	0	0	0.6	1.0	4.0	Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Ban the sale of all new 2stroke reciprocating engines which can be replaced with 4-stroke or electric. Limit the organic emissions from new 4-stroke engines using current technology in the short term; eventually replace some gasoline engines with electric powered units, where possible.

PROBABLE METHOD OF CONTROL:

This control measure would primarily affect emissions from 2-stroke and 4-stroke gasoline-powered reciprocating engines. There would be no effect on emissions from oil-fueled engines. Reductions will be achieved by banning the sale of most new 2-stroke engines, and then controlling the emissions from new 4-stroke gasoline-powered engines. These controls account for 95% of the total expected reduction in organics. Equipment subject to this ban/control includes lawn and garden equipment and some home utility engines with exceptions for light hand-held units. All affected new units sold after the date of adoption would need to be either low-emission 4-stroke (lean burn, fixed main jet, etc.) or electric. Since oil-fueled engines are used primarily as stand-by electric generating units, it is not possible to replace these engines with electric motors. New gasoline engine electric generators would be required to use low-emission 4-stroke engines.

OTHER IMPACTS:

COMMENTS:

ARB has jurisdiction for these sources. This measure would require ARB action on a statewide basis.

PROPOSED CONTROL MEASURE - #20

*****NOT REASONABLY AVAILABLE*****

CONTROL MEASURE NAME: **Gasoline Farm Tractors**

EMISSION ESTIMATES:

BAAQMD Inventory:	**1979**	**1987**	
#123 Farm Tractors - Gasoline	0.6	0.4	Tons/Day
Current Estimate	"	"	
Subject to Control		0.2	
Potential Reduction		**0.1**	

COST EFFECTIVENESS: **$400/ton**

REACTIVITY: **high**

YEAR OF ADOPTION:

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction							Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Control measure would affect new gasoline engine tractors by requiring exhaust hydrocarbon emission controls similar to those currently employed on highway motor vehicles.

PROBABLE METHOD OF CONTROL:

Control methods include engine and carburetor modifications and installation of air pumps and/or catalytic converters.

COMMENTS:

Difficult or impossible to control farm equipment because they are not registered or licensed by DMV. High costs required to enforce this measure probably not justified for small potential emission reduction in rural areas.

Revised 12/1/82

PROPOSED CONTROL MEASURE - #21

*****NOT REASONABLY AVAILABLE*****

CONTROL MEASURE NAME: **Diesel Construction Equipment**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#126 Constr. Equip. - Diesel	5.2	5.8	Tons/Day
Current Estimate	"	"	
Subject to Control		5.8	
Potential Reduction		**1.5**	

COST EFFECTIVENESS: **$4000/ton**

REACTIVITY: **medium**

YEAR OF ADOPTION:

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction							Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Control measure would affect new and existing diesel construction equipment by requiring an annual maintenance program.

PROBABLE METHOD OF CONTROL:

Injection rate, timing, and spray pattern would be set to manufacturer's specifications. Annual maintenance could result in some cost savings through fuel savings.

OTHER IMPACTS:

Tuning engines for low organic emissions is likely to increase emissions of NOx.

COMMENTS:

Difficult to enforce because--

a) operators do a lot of field maintenance and adjustments to improve performance,

b) machines have no license plates; are not registered,

c) owners/operators move equipment to many different job sites, including other states.

PROPOSED CONTROL MEASURE - #22

CONTROL MEASURE NAME: **Vegetable Oil Manufacturing**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#81 Other Organics Evaporation	14.7	10.9	Tons/Day
Current Estimate	"	"	
Subject to Control		0.8	
Potential Reduction		**0.4**	

COST EFFECTIVENESS: **$1000/ton**

REACTIVITY: **low**

YEAR OF ADOPTION: **1986**

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction	0	0	0	0	0	0.4	Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Control measure would affect vegetable oil manufacturing plants by requiring control of solvent emissions from extractors, desolventizers, dryers, coolers and conveyors, per draft EPA Control Technology Guideline.

PROBABLE METHOD OF CONTROL:

Install mineral oil scrubber on extractor/desolventizer. Minimize solvent carry-over to dryer, cooler and conveyors by proper maintenance and operation.

OTHER IMPACTS:

COMMENTS:

There is only one vegetable oil manufacturing plant in the District. Some of the proposed controls have already been implemented.

PROPOSED CONTROL MEASURE - #23

CONTROL MEASURE NAME: **Aerospace Assembly and Component Coating Operations**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#61 Industrial Coating-High Solv	73.7	15.3	Tons/Day
Current Estimate	"	"	
Subject to Control		2.3	
Potential Reduction		**0.5**	

COST EFFECTIVENESS: **$1000/ton**

REACTIVITY: **varies**

YEAR OF ADOPTION: **1982**

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction	0	0.1	0.1	0.2	0.2	0.5	Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Control measure would affect reactive organic compound emissions from primer and topcoat application, paint stripping, surface preparation and clean-up.

PROBABLE METHOD OF CONTROL:

Coatings manufacturors would reformulate paints by converting to water-borne or high-solids paints, or substituting non-reactive solvents for reactive solvents in conventional paints. Interim limits would become effective in 1983, final limits in 1985; military user exemption would expire in 1987.

P R O P O S E D   C O N T R O L   M E A S U R E   -   # 2 4

CONTROL MEASURE NAME: **Rubber/Plastic Products Manufacturing**

EMISSION ESTIMATES:

BAAQMD Inventory:	**1979**	**1987**	
#74 Rubber/Plastic Prod. Mfg.	7.6	7.6	Tons/Day
Current Estimate	7.6	7.6	
Subject to Control	5.5	5.5	
Potential Reduction		**1.1**	

COST EFFECTIVENESS: **$1600/ton**

REACTIVITY: **low**

YEAR OF ADOPTION: **1986**

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction	0	0	0	0	0	1.1	Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Major sources of organic emissions from rubber/plastic manufacturing are emissions of raw materials, monomers, solvents and other volatile liquids from reactors--blow down tanks--drying operations and emissions of solvents during storage and handling of thinned resins. Control equipment includes floating roof tanks or vapor recovery systems on volatile material, storage units, vapor recovery systems (adsorption or condensers). Purge lines that vent to flare system. and recovery systems on vacuuim exhaust lines. Fugitive emissions must meet a leak detection and repair program (quarterly monitoring) with an action level of 10,000 ppm (expressed as methane).

PROBABLE METHOD OF CONTROL:

Storage tanks of greater than or equal to 37.5 M^3 (10,000 gals.) and greater than or equal to 0.033 bar (0.5 PSIA) will require floating roof and two seals or vapor recovery of 95% by weight or any any alternative that can be proved to meet 95% (wt.) control of organic emissions. Install vapor recovery units for process vessel vents, truck loading and drum filling stations, and easily manifolded relief valves or an alternative of venting emissions to a certified flare or incinerator at 95% control. Pump seals will be retrofitted with dual seals (barrier fluid and degassing vents to the compressor. Exempt any process vent that emits smaller than or equal to 5 kg (11 lbs) of organic material per day.

Revised 10/6/82

PROPOSED CONTROL MEASURE - #25

CONTROL MEASURE NAME: **Pleasure Boats**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#136 Pleasure Boats - diesel	0.3	0.3	Tons/Day
#137 Gasoline, 2-Stroke	6.3	6.9	
#138 Gasoline, 4-Stroke	6.3	6.9	
Total	12.9	14.1	
Subject to Control		13.8	
Potential Reduction		**7.0***	

COST EFFECTIVENESS: **$8000/ton**

REACTIVITY: **high**

YEAR OF ADOPTION: Contingency Measure

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction							Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Emission standards for new boat engines to control HC emissions. Set standard to achieve a 50% inventory reduction by 1987. A change in usage towards sailboats, instead of gasoline-powered boats (prevalent on coastal areas), should also reduce HC emissions. The latter, however, may be unenforceable.

PROBABLE METHOD OF CONTROL:

Similar to automotive engine controls.

OTHER IMPACTS:

Use controls would be difficult to enforce. ARB responsibility for hardware controls on engines for reasons of precedent, expertise, and statewide uniformity.

ALTERNATIVE CONTROL MEASURE 25-B: *****NOT REASONABLY AVAILABLE*****

Ban use of 2-cycle engines on ozone days.

ALTERNATIVE 25-C: *****NOT REASONABLY AVAILABLE*****

Ban all I C engine pleasure boats on high ozone days.

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*Note that summer day reductions would be approximately twice annual average daily reductions.

Revised 12/1/82

PROPOSED CONTROL MEASURE - #26

*****NOT REASONABLY AVAILABLE*****

CONTROL MEASURE NAME: **Marine Lightering Retrofit**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#79 Lightering, Marine Transfer	4.5	4.1	Tons/Day
Current Estimate	7	7	
Subject to Control		4	
Potential Reduction		3	

COST EFFECTIVENESS: **$15,000/ton**

REACTIVITY: **low**

YEAR OF ADOPTION:

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction							Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Require 90% control of VOC emissions from lightering in District waters. Large tankers transporting crude oil sometimes find it necessary to offload part or all of their cargo into smaller tankers or barges because of draught restrictions.

PROBABLE METHOD OF CONTROL:

Hydrocarbon vapors are displaced from the cargo holds of the smaller vessel during filling. These emissions can be controlled by ducting displaced vapors back to the "mother" ship, for disposal at sea.

OTHER IMPACTS:

Companies who do not have a dedicated fleet may not be able to comply. SB 1732 (Marks, 1982) would prohibit State ARB from implementing any emission requirements for marine vessels prior to July 1, 1982. ARB is to submit recommendations to the Legislature by that date. Both report and prohibition may be delayed one year. Coast Guard jurisdiction for marine vessel safety.

ALTERNATIVE CONTROL MEASURE 26-B

Dredge ship channels to eliminate need for lightering.

Revised 10/6/82

PROPOSED CONTROL MEASURE - #27

CONTROL MEASURE NAME: **Off-Road Motorcycles**

EMISSION ESTIMATES:

BAAQMD Inventory:	1979	1987	
#166 Offroad Motorcycle-2 stroke	1.6	2.2	Tons/Day
#167 -4 stroke	0.8	1.1	
Total	2.4	3.3	
Subject to Control		2.2	
Potential Reduction		**0.8**	

COST EFFECTIVENESS: **$400/ton**

REACTIVITY: **high**

YEAR OF ADOPTION: Contingency Measure

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction							Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Ban sale of new 2-stroke motorcycles in favor of 4-stroke.

PROBABLE METHOD OF CONTROL:

New rule, banning the sale of off-road motorcycles with 2-stroke engines. If 2-stroke motorcycles were replaced by 4-stroke, an estimated 24% reduction in total HC emission would be achieved. This amounts to 0.8 tons/day. For 1987 increase in 4-stroke motorcycle ownership brings an additional 0.3 tons/day of HC emissions, but there would be a decrease of 1.2 tons/day due to the phasing out of 2-stroke motorcycles (it is estimated 40% 2-stroke motorcycles in 1987. Hence, a net decrease of 0.8 tons/day.

OTHER IMPACTS:

Some buyers may purchase 2-stroke bikes outside the region and bring them in. Would require ARB action for uniform policy statewide.

COMMENTS:

Most off-road riding done on weekends in rural areas; may have little effect on weekday urban ozone. Use controls would be difficult or impossible to enforce.

ALTERNATE CONTROL MEASURE #27-B:***NOT REASONABLE AVAILABLE***

Ban use of off-road motorcycles on high ozone days.

PROPOSED CONTROL MEASURE - #28

CONTROL MEASURE NAME: **Industrial Maintenance Coatings**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#63 Other Coating - High Solv.	19	20	Tons/Day
Current Estimate	"	"	
Subject to Control		2	
Potential Reduction		**1**	

COST EFFECTIVENESS: **$1000/ton**

REACTIVITY: **low**

YEAR OF ADOPTION: **1985**

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction	0	0	0	0	0.5	1	Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Control measure would affect organic solvent emissions from in-use maintenance painting of machinery and equipment.

PROBABLE METHOD OF CONTROL:

Measure would require reformulation of paints by the coatings industry. Water-borne or high-solids coatings would be substituted for conventional high solvent points.

OTHER IMPACTS:

COMMENTS:

These coatings are typically applied to equipment in the field by owners, operators or repair personnel--not manufacturers. Potential problem exists for the application of unconventional coatings by non-expert personnel.

PROPOSED CONTROL MEASURE - #29

CONTROL MEASURE NAME: **Sanitary Landfill Sites**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#175 Bio-degrdation (99+ wt. % methane)	797	867	Tons/Day
Current Estimate	797	867	
Subject to Control		867	
Potential Reduction	--	858	
Non-methane reduction		7.2	

COST EFFECTIVENESS: **$3600/ton** (reactive organics)

REACTIVITY: **low**

YEAR OF ADOPTION: **1984**

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction	0	0	3.5	6.5	7.1	7.2	Tons/Day reactives

DESCRIPTION OF CONTROL MEASURE:

Control measure would affect hydrocarbon emissions resulting from the anaerobic decomposition of solid waste at sanitary landfill sites, with exemption for sites below a certain acreage size. The control measure assumes 50% of emissions are subject to control in 1984, the remaining 50% in 1986.

PROBABLE METHOD OF CONTROL:

Install gas wells and header system to collect hydrocarbon gases, which would be ducted to a combustion device for disposal. An alternate is to process gases to separate methane from non-methane portion; combust non-methane portion and pipe methane portion to fuel customer or gas pipeline.

OTHER IMPACTS:

COMMMENTS:

Sale of methane portion could substantially reduce costs or may result in a profit.

Revised 10/6/82

PROPOSED CONTROL MEASURE - #30

CONTROL MEASURE NAME: **Marine Vessel Gas-Freeing**

EMISSION ESTIMATES:

BAAQMD Inventory:	1979	1987	
#79 Lightering/etc.	4.5	4.1	Tons/Day
Current Estimate	7		
Subject to Control		0.1	
Potential Reduction		**0.1**	

COST EFFECTIVENESS: **$500/ton**

REACTIVITY: **medium**

YEAR OF ADOPTION: Contingency Measure

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction							Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Prohibit gas-freeing within District waters. Exemptions for safety or ships in harbor may be considered.

PROBABLE METHOD OF CONTROL:

Operations of tankers and barges that carry petroleum products often wash and aerate the cargo tanks of such vessels, prior to dry-docking or changing cargos. These emissions can be controlled by carrying out such housekeeping operations outside District waters or by venting to a vapor recovery system.

OTHER IMPACTS:

COMMENTS:

Difficult to enforce.

PROPOSED CONTROL MEASURE - #31

CONTROL MEASURE NAME: **Tanker Ballasting**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#79 Lightering/Marine Transfer	4.5	4.1	Tons/Day
Current Estimate	7	7	
Subject to Control		3	
Potential Reduction		**2.5**	

COST EFFECTIVENESS: **$1600/ton**, but already required; no new costs.

REACTIVITY: **low**

YEAR OF ADOPTION: **1981**

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction		1	2	2.5	2.5	2.5	Tons/Day

DESCRIPTION OF CONTROL MEASURE:

No action necessary by District. United States Coast Guard has promulgated a rule (33 CFR, Parts 154-155,157) effective June 1981. This rule requires either a segregated ballast, or washed ballast tank and inert gas system. The rule is applicable to tankers of size greater than 20,000 DWT.

PROBABLE METHOD OF CONTROL:

Segregated ballast, internal vapor balance, compression ballasting, or vapor recovery/disposal.

OTHER IMPACTS:

Revised 10/6/82
12/6/82

PROPOSED CONTROL MEASURE - #32

CONTROL MEASURE NAME: **Semiconductor & Printed Circuit Board Mfg. Operations**

EMISSION ESTIMATES:

BAAQMD Inventory:	1979	1987	
Various Categories			Tons/Day
Current Estimate	8	9	
Subject to Control	7.5	8	
Potential Reduction		**5.7**	

COST EFFECTIVENESS: **$3800/Ton**

REACTIVITY: **medium-high**

YEAR OF ADOPTION: **1983**

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction			2.9	5.7	5.7	5.7	Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Measure would require 85% reduction in organic emissions from photoresist line and solvent cleaning operations in the elctronic industry.

PROBABLE METHOD OF CONTROL:

Carbon adsorption or catalytic oxidation.

OTHER IMPACTS:

COMMENTS:

Control measures are already being developed. New information expected from industry technical committees and BAAQMD engineers.

Revised 12/6/82

PROPOSED CONTROL MEASURE - #33

CONTROL MEASURE NAME: **Coating of Plastics**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#61 Industrial Coatings	73.7	15.3	Tons/Day
#73 Rubber/Plastic Prod. Mfg.	7.6	7.6	
Current Estimate		5	
Subject to Control		3	
Potential Reduction		2	

COST EFFECTIVENESS: **$1000/ton**

REACTIVITY: **medium**

YEAR OF ADOPTION: **1985**

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction	0	0	0	1	2	2	Tons/Day

DESCRIPTION OF CONTROL MEASURE:

The control measure would require the use of high-solids or water-borne coatings for coating plastic parts and products. The measure will require the reformulation of paints by the coating industry.

PROBABLE METHOD OF CONTROL:

As described above.

OTHER IMPACTS:

Would affect electronics, automotive, and toy industries.

PROPOSED CONTROL MEASURE - #34

*****NOT REASONABLY AVAILABLE*****

CONTROL MEASURE NAME: **Pleasure Boat Fueling** (Gasoline)

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory: #50-55 Fuel Distribution	19.7	16.5	Tons/Day
Current Estimate			
Subject to Control		0.2	
Potential Reduction		**0.2**	

COST EFFECTIVENESS: **$15,000/ton**

REACTIVITY: **low**

YEAR OF ADOPTION:

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction							Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Change Regulation 8, Rule 7, to include dispensing gasoline to boats.

PROBABLE METHOD OF CONTROL:

Vacuum assist systems for gasoline dispensing at marinas.

OTHER IMPACTS:

COMMENTS:

Present systems not effective for this source application because of:

a) long hose requirements for access,
b) storage tanks often at higher elevation than dispensing point so vacuum assist not usable,
c) variety of filler neck configurations on boat give poor interface,
d) increased likelihood of spills on boats with tank vent pipe level below fill neck.

This measure appears to be impractical because of technical and safety problems, high cost, low reduction potential, and temporal pattern of emissions (expect most pleasure boat use on weekends).

Revised 10/6/82

PROPOSED CONTROL MEASURE - #35

CONTROL MEASURE NAME: **New Source Review**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory: all categories			Tons/Day
Current Estimate			
Subject to Control			
Potential Reduction		**0.2**	

COST EFFECTIVENESS: varies from **savings** to a max cost of **$8000/ton**

REACTIVITY: **varies**

YEAR OF ADOPTION: Contingency Measure

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction							Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Control measure would affect new and modified sources subject to the "New Source Review" requirements of the permit regulation(Regulation 2 - Rule 2). Organic emission offset ratio requirements would be increased from 1.0:1 to 1.1:1 or 1.2:1, for offsets provided on-site. Emission profiling would be eliminated from emission offset calculation procedures in favor af annual average calculations. Emission profiling would only be used to determine if emission increases were in excess of the deminimus level of 250 lb/day. The proposed strategy should simplify procedures and require less time for processing, which would provide some cost savings for the applicants. However, the cost of providing additional offsets would likely be higher than range of costs to meet RACT requirements. A worst case estimate for cost effectiveness is $8000/ton.

PROBABLE METHOD OF CONTROL:

Modify Regulation 2 - Rule 2 to require an increased organic emission offset ratio.

COMMENTS:

Must define treatment of permits, offsets, banking transactions which take place after plan adoption but before rule adoption.

P R O P O S E D   C O N T R O L   M E A S U R E - # 3 6

CONTROL MEASURE NAME: **Ozone from Irradiation Beams**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory: none	0	0	Tons/Day Ozone
Current Estimate	0.1	0.1	
Subject to Control		0.1	
Potential Reduction		**0.1**	

COST EFFECTIVENESS: **$1000/Ton**

REACTIVITY: **N/A**

YEAR OF ADOPTION: To be considered separately from 1982 Plan process.

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction							Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Control measure would affect operations which employ irradiation beams and emit ozone directly. Sources are primarily located in Santa Clara County.

PROBABLE METHOD OF CONTROL:

Measure would require installation of high surface area, iron oxide packed scrubbers on ozone emitting sources.

OTHER IMPACTS:

PROPOSED CONTROL MEASURE - #37

NOT REASONABLY AVAILABLE

CONTROL MEASURE NAME: **Tree Replacement**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#177 Vegetation	493	493	Tons/Day
Current Estimate Subject to Control	125	125	
Potential Reduction		**5**	

COST EFFECTIVENESS: **unknown**

REACTIVITY: **high**

YEAR OF ADOPTION:

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction							Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Require replacement of 10% of high VOC emitting species (e.g. certain hardwoods and conifers) with low-emitting, preferably native, species. Focus on public lands.

PROBABLE METHOD OF CONTROL:

Replace 10% of trees on public lands in central area of the District. Primary Implementing agencies: U.S. Forest Service, State Parks, East Bay and other Park Districts, California Department of Forestry.

OTHER IMPACTS:

Sensitive issue--may meet resistance for aesthetic and political reasons. Could produce income for landowner if trees have lumber or firewood value. If this action increases the supply and/or emissions from woodfires during winter, such emissions could interfere with attainment of carbon monoxide and particulate standards.

Revised 12/6/82

PROPOSED CONTROL MEASURE - #38

CONTROL MEASURE NAME: **Large Commercial Bakeries**

EMISSION ESTIMATES:

BAAQMD Inventory:	**1979**	**1987**	
#32 Bakeries (Industrial	1.6	1.8	Tons/Day Ozone
Current Estimate			
Subject to Control		1.2	
Potential Reduction @ 90%		**1.1**	

COST EFFECTIVENESS: **undetermined**

REACTIVITY: **low**

YEAR OF ADOPTION: **1986**

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction	0	0	0	0	0.6	1.1	Tons/Day Ozone

DESCRIPTION OF CONTROL MEASURE:

Control measure would affect only the large commercial bakeries using the sponge-dough process of making bread. Commercial bakeries using the sponge-dough process should be encouraged to convert to a straight-dough process, if possible. Since the majority of the organic emissions will be emitted from the ovens during baking, control measure would require incineration of organic gases emitted from the baking oven.

PROBABLE METHOD OF CONTROL:

Control measures will take the form of requiring commercial bakeries using the sponge-dough process to install direct flame or catalytic afterburners downstream of their baking ovens. Alternative means of control may involve recirculation of organic gases emitted from the ovens to the flame zone of the oven (method available only if direct-fired ovens are used); the use of an existing boiler as an afterburner.

OTHER IMPACTS:

COMMENTS:

May be difficult to remove low concentrations of organic compounds from large air volumes.

PROPOSED CONTROL MEASURE - #39

*****NOT REASONABLY AVAILABLE*****

CONTROL MEASURE NAME: **Develop and Tighten Plant Emission Limits**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory: #11, 12, 42, 44, 47-51, 57, 58, 61, 62, 65, 75-77, 79, 81	90	90	Tons/Day
Current Estimate	"	"	
Subject to Control		50	
Potential Reduction		**5**	

COST EFFECTIVENESS: varies with source category:
surface coating - **$5000/ton**
petroleum refining - **$11,000/ton**
auto assembly - **$30,000/ton**

REACTIVITY: **varies**

YEAR OF ADOPTION:

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction							Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Control measure would affect stationary sources with stationary source organic emissions greater than 100 tons per year. Proposed strategy would require the District to develop maximum allowable emission limits for these facilitites and then require a 10% reduction of baseline organic emissions at each facility. Baseline emission calculations would include the effect(s) of any RACT rule(s). Each facility would determine the most cost effective means of achieving the 10% reduction. Since RACT is currently required at most of the affected facilities, the cost effectiveness for this measure would likely be greater than the range of RACT costs encountered to date, and may include the use of RACT on existing sources. Three years has been proposed as a resonable time period to implement the required control strategy.

PROBABLE METHOD OF CONTROL:

Expected to vary with source category and/or specific facility. The method of control may include: the replacement of existing manufacturing units with less polluting sources, the possible curtailment or shutdown of highly polluting sources and the use of less polluting sources to manufacture needed materials.

OTHER IMPACTS:

COMMENTS:

Difficult to find new reductions beyond present and proposed regulations.

PROPOSED CONTROL MEASURE - #40

*****NOT REASONABLY AVAILABLE*****

CONTROL MEASURE NAME: **Airport Fuel Transfer** (Gasoline)

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#50-55 Fuel Distribution	19.7	16.5	Tons/Day
Current Estimate			
Subject to Control		.08	
Potential Reduction		**.08**	

COST EFFECTIVENESS: **$3500/ton**

REACTIVITY: **low**

YEAR OF ADOPTION:

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction							Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Change Regulation 8 to include airport facilitites in Rules 6 and 7.

PROBABLE METHOD OF CONTROL:

Measure would require vapor recovery at:
1) Truck loading rack for distribution to planes.
2) Nozzle islands for planes and on bulk truck.

COMMMENTS:

Present control equipment designed for automobiles; suitability and compatibility with aircraft systems has not been tested. CARB and FAA may have jurisdiction. Important safety consideration.

OTHER IMPACTS:

Revised 10/6/82

PROPOSED CONTROL MEASURE - #41

CONTROL MEASURE NAME: **New Service Stations**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#55 Filling Sta.-Veh. Tanks	6.4	5.5	Tons/Day
Current Estimate			
Subject to Control		.01	
Potential Reduction		.002	

COST EFFECTIVENESS: **unknown**, very high cost/ton because little or no reduction.
REACTIVITY: **low**

YEAR OF ADOPTION: Contingency Measure

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction							Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Modify Regulation 8, Rule 7 to require the use of secondary assist vapor recovery systems for vehicle fueling at new service stations. Non-retail equipment would be exempted.

PROBABLE METHOD OF CONTROL:

Secondary assist at new service stations, expected to increase collection efficiency.

OTHER IMPACTS:

COMMENTS:

CARB certified balance system and vacuum assist at the same level of control. SCAQMD study shows performance of both types of systems are the same. Doubtful that addition of vacuum assist would reduce emissions.

PROPOSED CONTROL MEASURE - #42

CONTROL MEASURE NAME: **Zero Gap Seals on Floating Roof Tanks**

EMISSION ESTIMATES:

	1979	1987	
BAAQMD Inventory:			
#47 Ref. Storage & Blending	12.2	12.5	Tons/Day
#50 Bulk Plant Storage Tanks	1.2	0.9	
#57 Storage Tanks - Solvent	1.2	1.0	
#58 Storage Tanks - Other	1.8	2.0	
Total	16.4	16.4	
Subject to Control			
Potential Reduction		**1.5**	

COST EFFECTIVENESS: **$1200/ton**

REACTIVITY: **medium**

YEAR OF ADOPTION: **1985**

IMPLEMENTATION SCHEDULE:

	1982	1983	1984	1985	1986	1987	
Reduction	0	0	0	0	.8	1.5	Tons/Day

DESCRIPTION OF CONTROL MEASURE:

Require a tight-fitting secondary seal on most floating-roof storage tanks.

PROBABLE METHOD OF CONTROL:

A tight-fitting seal, such as the RFI Weatherguard, exerts a pressure of 30 psi on the wall of the tank. This control measure would reduce emissions from 60 large tanks in the District.

OTHER IMPACTS:

COMMMENTS:

About 90 tanks in the Bay Area already use these seals. Seal pressure should be set at a safe fraction of tank wall strength.

APPENDIX B

TRANSPORTATION CONTROL MEASURES

TRANSPORTATION CONTROL MEASURES (TCMs)

EMISSION ESTIMATES:

BAAQMD Inventory:	1979			1987		
	HC	CO	NO_x	HC	CO	NO_x
Cars & Light Duty Trucks	297.0	2450.0	239.0	159.0	1470.0	146.0
Heavy Duty Trucks & Buses	28.1	402.0	70.8	18.7	457.0	39.2
Motorcycles	5.0	15.1	0.2	2.4	7.1	0.2
Total	330.1	2867.1	310.0	180.1	1934.1	185.4
Current Estimate	330.1	2867.1	310.0	180.1	1934.1	185.4
Subject to Control	283.1	2867.1	310.0	162.7	1934.1	185.4
Potential Reduction				2.69	25.90	2.79

COST EFFECTIVENESS: All of the proposed TCMs have other benefits in addition to the listed emission reductions. The costs could not be attributed solely to air quality, so a cost-effectiveness number was not calculated.

REACTIVITY: high

YEAR OF ADOPTION: 1982

IMPLEMENTATION SCHEDULE:

		1982	1983	1984	1985	1986	1987	
Reduction	HC	0.00	0.31	1.0	1.6	2.18	2.69	tons/da
	CO	0.00	2.98	11.87	14.67	20.13	25.90	
	NO_x	0.00	0.23	1.02	1.73	2.37	2.79	

DESCRIPTION OF CONTROL MEASURE:

Ten individual transportation control measures were adopted. Each is described in detail on the following pages. Also included are the general objectives that were proposed by ARB staff and endorsed by MTC.

TCM #1: Reaffirm commitment to 28% transit ridership increase between 1978 and 1983

EMISSION REDUCTION ESTIMATES: Since this measure was included in the 1979 Air Quality Plan, its effects were included in the baseline emissions inventory and no additional credits are claimed.

COST: The cost of supplying this level of transit service was included in the Transportation Improvement Program. Thus there are no additional costs associated with this measure.

IMPLEMENTATION SCHEDULE:

- o MTC reaffirms measure in 1982 Review of Air Quality Plan
- o Assess effectiveness of measure in annual RFP reports

DESCRIPTION OF CONTROL MEASURE:

In the 1979 Air Quality Plan, MTC adopted a strategy to improve transit service based upon the transit operators' five year plans. It was estimated that this strategy would increase transit ridership by 28% between 1978 and 1983. The plans are being implemented and the ridership has been increasing consistent with the target. This TCM would reaffirm the commitment to the 1979 strategy.

OTHER IMPACTS

- o According to 1970 census, the San Francisco-Oakland urbanized area had 14.97% of all workers commuting on transit. In 1980, the proportion had increased to 17.47%.
- o The shift to transit is partially responsible for the decline in gasoline consumption in the Bay Area.
- o Congestion at bottlenecks has not appreciably worsened, even though the number of people traveling through these corridors has increased.

TCM #2: Support post-1983 improvements identified in transit operator's 5-year plans, after consultation with the operators adopt ridership increase target for 1983-1987.

EMISSION REDUCTION ESTIMATES: These emission reduction estimates are predicated on a 15% ridership increase. The actual target would be determined after consultation with the transit operators.

	1983	1984	1985	1986	1987	
HC:	0	.23	.42	.60	.72	tons/day
CO:	0	2.03	4.03	5.80	7.15	
NO_x:	0	.36	.68	.94	1.04	

COST: Costs of maintaining the existing level of services is currently programmed in regional allocations. Ridership increases would come from productivity improvements, thus additional costs would be moderate.

IMPLEMENTATION SCHEDULE:

- o 6 major transit operators adopt FY 1983-87 plans by July, 1982
- o MTC consults with operators on ridership targets by Jan., 1983
- o MTC, through implementation of the TIP and allocation of regional funds, seeks to ensure operators' 5-year plans are implemented
- o Ridership gains are monitored through annual RFP reports

DESCRIPTION OF CONTROL MEASURE:

This measure is basically an extension of TCM #1. Since federal funds for transit purposes are being cut back, many of the improvements identified in the 5 year plans deal with increased productivity. Thus, while the size of the transit system may not grow significantly, the ridership is expected to increase.

OTHER IMPACTS

- o 31,600 gallons of gasoline saved.
- o Alternatives to automobile travel will be increased.

TCM #3: Seek to expand and improve public transit beyond committed levels.

EMISSION REDUCTION ESTIMATES:

	1983	1984	1985	1986	1987	
HC:	0	.12	.22	.30	.37	tons/day
CO:	0	.85	1.61	2.28	3.69	
NO_x:	0	.18	.34	.47	.54	

COST: The transit operators have submitted capital requests for FY 83-87. Of these, $119.4 million cannot be funded with currently anticipated revenues. Additional funds would also be needed for operating subsidies. However, this program has other benefits, as the costs cannot be solely attributed to air quality.

IMPLEMENTATION SCHEDULE:

o MTC seeks sources of new revenue -- ongoing effort

o If funding exists, transit operators implement plans to expand services.

DESCRIPTION OF CONTROL MEASURE:

The transit operators have submitted capital requests which cannot be funded with presently anticipated revenues. These capital requests were previously for service expansions. MTC is exploring ways of raising additional revenue but the fiscal problems of the federal and state governments make it unlikely that significant additional revenues can be generated in the near future.

OTHER IMPACTS

o 16,300 gallons of gasoline saved per day.

o Alternatives to automobile travel will be increased.

TCM #4: Continue to support development of HOV lanes. (Emission credit would not be allowed for specific projects until environmental studies were completed and funds were programmed.)

EMISSION ESTIMATES: Depends on specific project.

COST: Varies by specific project design and implementation. Since these projects do have other benefits, the costs cannot be solely attributed to air quality.

IMPLEMENTATION SCHEDULE:

- o MTC will continue to support HOV lanes where justified on a case by case basis. The following projects are ones where HOV treatments are being considered.

- o I-580 from Rte. 24 to Bay Bridge - EIS to be completed Fall, 1983, project implementation by 1987.

- o Rte. 101 in Marin (Stage 2) - Negative Declaration under review, project implementation by 1986.

- o I-80 - EIS to be completed September, 1983, project implementation unknown.

- o Rte. 237 from Lawrence Expressway to Rte. 17 - environmental documentation under review, construction by 1984-85

DESCRIPTION OF CONTROL MEASURE:

High occupancy vehicle lanes permit exclusive rights of way to vehicles with three or more people. Included in this measure are projects which have highway ramp meters with an HOV bypass lane.

OTHER IMPACTS

- o Increases capacity without adding to congestion

- o Incentive for transit use and ridesharing

TCM #5: Continue to support RIDES efforts.

EMISSION ESTIMATES: Since this measure was included in the 1979 Air Quality Plan, its effects are incorporated in the baseline emissions inventory and no additional credit is claimed.

COST: Funds are already programmed to assist the RIDES effort so there are no additional costs associated with this measure.

IMPLEMENTATION SCHEDULE:

- o MTC reaffirms measure in 1982 Review of Air Quality Plan
- o Effectiveness of measure assessed in annual RFP reports

DESCRIPTION OF CONTROL MEASURE:

RIDES, a non-profit corporation funded by Caltrans District 4 and the MTC is the primary agency for ridesharing services. RIDES offer two services. One is a carpool-matching program targeted to specific employers. The second is a vanpooling program where the agency leases vans to the participants. RIDES has been successful in both of these efforts.

OTHER IMPACTS

- o The use of RIDES services are partially responsible for the decline in gasoline consumption in the Bay Area. RIDES estimates that, through their efforts, 3.6 million gallons of gas were saved in FY 1980-81.
- o Increases capacity without increasing congestion

TCM #6: Continue efforts to obtain funding to support long-range transit improvements.

EMISSION ESTIMATES: It is not anticipated any of these projects included in this measure can be implemented prior to 1987. Hence no emissions credits are claimed. MTC will nevertheless support long-range transit improvements where justified.

COST: Project design costs over the next 5 years total $35 million. Construction costs of the Guadalupe project over the next 5 years is $181 million. Because these projects have other benefits, the costs cannot be solely attributed to air quality.

IMPLEMENTATION SCHEDULE: Assuming federal funding for new rail starts:

- o Guadalupe - engineering design to be completed Fall, 1983
- o BART - design of North Concord and Warren Springs extensions will begin in FY 82-83

DESCRIPTION OF CONTROL MEASURE:

Long range transit improvements that are currently being studied included a light rail line in the Guadalupe Corridor and various BART extensions. None of these will be fully operational before 1987, but design and construction of some of these segments are programmed in the next five years.

OTHER IMPACTS

- o Increases capacity without increasing congestion
- o Demand for electrical power will increase

TCM #7: Reaffirm commitment to preferential parking program

EMISSION ESTIMATES: Since this measure was included in the 1979 Air Quality Plan, its effects were included in the baseline emissions inventory and no additional credits are claimed.

COST: The cost of providing some of the preferential parking projects are included in the Transportation Improvement Program. Thus there are no additional costs associated with this measure.

IMPLEMENTATION SCHEDULE:

- MTC reaffirms measure in 1982 Review of Air Quality Plan
- Caltrans to open 6 lots in FY 1982-83, 3 in FY 1983-84, and 8 in FY 1984-85
- Assess effectiveness of measure in annual RFP reports

DESCRIPTION OF CONTROL MEASURE:

Caltrans has opened a number of fringe parking lots and is planning to open 17 more in next 5 years. Caltrans also has a program which allows free vanpool parking in downtown San Francisco.

OTHER IMPACTS

- The use of preferential parking facilities is partially responsible for the decline in gasoline consumption in the Bay Area.

TCM #8: Encourage transit operators to work with Caltrans to identify under-utilized lots along major transit lines which could be used as park-and-ride lots.

EMISSION ESTIMATES:

	1983	1984	1985	1986	1987	
HC:	0	.02	.03	.03	.04	tons/day
CO:	0	.06	.11	.16	.19	
NO_x:	0	.01	.02	.03	.05	

COST: The equivalent annual cost of this measure is $22,850. Because these projects have other benefits, the costs cannot be solely attributed to air quality.

IMPLEMENTATION SCHEDULE:

o Continue the on-going program which will establish 14 new joint use parking lots per year.

DESCRIPTION OF CONTROL MEASURE:

Caltrans has a project called the Joint Usage Lot Program. This program encourages the use of available retail parking lot areas to be used for park-and-ride purposes. Caltrans provides liability insurance to the parking lot owners. The parking lot owner operates and maintains the parking area.

OTHER IMPACTS

o 1,900 gallons of gasoline will be saved per day

o Transit ridership should increase

o The program makes better use of existing resources

TCM #9: Expand Commute Alternative Program

EMISSION ESTIMATES:

	1983	1984	1985	1986	1987	
HC:	.17	.35	.52	.70	.87	tons/day
CO:	1.77	3.53	5.30	7.06	8.83	
NO_x:	.18	.36	.53	.71	.89	

COST: The equivalent annual cost of this measure is $50,000. Because this program has other benefits, the costs cannot be solely attributed to air quality.

IMPLEMENTATION SCHEDULE:

o Conduct two training sessions each year for the years 1983 through 1987

DESCRIPTION OF CONTROL MEASURE:

The Commute Alternatives Program seeks to involve the private sector in the enhancement of alternatives to commuting in the single-occupant auto. The program encourages employers to appoint Commute Coordinators who in turn disseminate information on ridesharing, transit, bicycling, flextime and a host of incentives to encourage alternative commute modes. The program consists of:

o a comprehensive training manual distributed to almost 400 persons in the Bay Area. The manual will be updated to include a chapter on Contingency Plans - which will discuss strategies particularly suited to air quality improvement. A section on efficient driving habits will also be included.
o training programs are conducted thoughout the Bay Area for new commute coordinators
o major employers are contacted directly, and through employer associations to participate in the program
o MTC fosters the development of commute coordinator associations to exhange ideas and new information on successful strategies.
o a newsletter is mailed bimonthly to commute coordinators

OTHER IMPACTS

o 18,000 gallon of gasoline are saved per day.

o Congestion is relieved

TCM #10: Develop information program for local governments.

EMISSION ESTIMATES:

	1983	1984	1985	1986	1987
HC:	.14	.28	.41	.55	0.69
CO:	1.21	2.42	3.62	4.83	6.04
NO_x:	.05	.11	.16	.22	0.27

COST: The equivalent annual administrative cost of this measure is $50,000. Because this program would have other benefits, this cost cannot be solely attributed to air quality.

IMPLEMENTATION SCHEDULE:

- o Compile and print manual by July, 1983
- o Conduct outreach/training program during FY 1983-84

DESCRIPTION OF CONTROL MEASURE:

MTC would develop an information manual for local governments detailing actions that cities can take to alleviate transportation-related problems. This program would build upon the present Commute Alternatives Program. Included in this manual would be:

- o discussion of transportation impacts of various developments and suggestions for possible mitigation actions
- o model ordinances to encourage commute alternatives and bicycle facilities
- o model parking ordinances
- o information on the Gasoline Conservation Awareness (GasCap) program
- o information on signalization

The program would also include personal contacts with local governments to promote this program.

OTHER IMPACTS:

- o Mitigation of adverse development impacts

The MTC has endorsed the general objectives as set forth in the attached comments from the California Air Resources Board as modified to:

a) make them consistent with MTC's statutory authority

b) remove specific targets and pollution reduction estimates

Comments on the Draft 1982
Bay Area Air Quality Plan

To the
MTC Work Program Committee

by

Anne B. Geraghty, Manager
General Projects Section
California Air Resources Board

October 8, 1982

We are pleased with the recent passage of SB 33 which provides for a biennual inspection and maintenance program. Because the draft Air Quality Plan assumes an annual program, we continue to have concerns about the likely shortfall of emission reductions needed to attain air quality standards by 1987. Under the biennual I&M program, attainment of carbon monoxide standards in Santa Clara County will not occur without additional measures.

We believe that it is possible for MTC to meet the BAAQMD's October 6th request to MTC to reduce hydrocarbon emissions by 3-5 tons per day. Some ways of meeting this goal will be described later in my testimony.

First, we wish to comment on the JAQPAC hearing held on September 7th in Santa Clara County. Numerous individuals and representatives spoke for the need for strong TCMs in the Bay Area, including the President of the Santa Clara County Manufacturing Group. We believe that the support for expanded TCMs articulated at the JAQPAC hearing, can be the base from which to develop and strengthen TCMs at the local and regional level.

Commute Alternatives

MTC staff is recommending combining TCMs 9 and 12 which continue and expand the Commute Alternatives measure. We agree with this approach and suggest the following additions to this measure.

1. Set a target of 50% employee participation in ridesharing by 1990. Santa Clara County and the Santa Clara County Manufacturing Group have identified this target for employers in the County. Achievement of a 15% commute trip reduction target for employers with 100 or more employees would reduce hydrocarbon emissions by approximately 3.6 tons/day, and carbon monoxide emissions by approximately 47.5 tons/day (see attached technical assumptions). In addition, if commute trips were reduced during peak hours, road capacity would be effectively increased.

2. Encourage local jurisdictions to adopt ridesharing ordinances that require large employers to actively encourage employee ridesharing.

3. Encourage establishment of employer associations such as the Santa Clara County Manufacturing Group to expand employee ridesharing in other Bay Area employment areas.

4. Expand the targeted training of 30 new coordinators per year to 10-20% of large employers per year (SB 320 funds can be used for this purpose).

5. Combine the Commute Alternatives measure with TCM #5, which continues support for the RIDES programs. Since these programs support each other, it seems appropriate to combine the benefits of emissions reductions.

6. Expand TCM #10, which would encourage local jurisdictions to reduce parking requirements for employers who encourage ridesharing through changes in local zoning ordinances and permit conditions.

7. Utilize ongoing public education efforts to inform motorists of the significant effect of vehicle cold-starts on air pollution emissions.

8. Require bicycle facilities at employment sites and other trip attractors and establish a target of 5% of all trips by bicycle. If 1.8% of auto trips less than three miles were diverted to bicycle by 1985, hydrocarbon emissions would be reduced by approximately 2.6 tons/day. If 5% of trips less than three miles were diverted to bicycles, hydrocarbon emissions would be reduced by 7.2 tons/day (see attached technical assumptions).

9. Establish a reporting mechanism for employers to monitor progress in achieving the county and regional targets.

Local Implementation

MTC staff is recommending combining TCMs #10, 11, and 13 which deal with parking requirements, bicycle, and drive-up window facilities into one measure. MTC staff proposes that a local implementation manual including model ordinances by prepared to assist local jurisdictions in implementing TCMs at the local level. MTC would schedule workshops to disseminate the information.

We agree with this approach since most transportation measures are the responsibility of local jurisdictions. We suggest the following additions:

1. That the cities and counties develop specific transportation-air quality programs with specific targets. City-county staff level task forces could be formed or existing mechanisms such as the Santa Clara County Transportation Advisory Committee could be used.

2. That MTC incorporate in its manual explanations about vehicle emissions behavior so that local traffic engineers and planners with this understanding can integrate vehicle emissions considerations into project design.

3. That MTC not limit the manual to the three measures mentioned but also include ridesharing ordinances and other promising measures.

Future Air Quality Planning in the Bay Area

We understand that the Bay Area Air Quality Management District plans to update its portion of the Air Quality Plan in 1984. We recommend that MTC take the same approach. Prior to developing a 1984 Air Quality Plan update, we recommend that MTC institute a process to significantly increase participation by local jurisdictions.

Other measures with potential for air quality improvements, signal timing, parking management, and fleet management, will be discussed by representatives of the California Energy Commission and the Gasoline Conservation Awareness Program.

Finally, we recommend that all suggested measures in the draft Plan remain in the final Plan for study and as contingency measures for implementation if shortfalls in attaining air quality standards occur.

Thank you for your concern for air quality. We appreciate the opportunity and will continue to be available to work with MTC and other agencies to develop strategies that will ensure a strong clean air program in the Bay Area.

APPENDIX C

ADDITIONAL MEASURES RECOMMENDED BY THE JOINT AIR QUALITY PLANNING AND ADVISORY COMMITTEE FOR CONSIDERATION IN THE DRAFT 1982 PLAN

CONTROL MEASURE NAME: LAND USE CONTROLS

Analysis of development trends during the late 1970s in the Bay Area showed that distances between home, work, shopping, school and recreation were increasing in ways that would cause more serious air pollution. This was because development was becoming ever more scattered, at lower density, with more separation between where people live and where they go. In many fringe areas, development occurred without sewer, water or transit service. Older city areas were bypassed, with little rebuilding or use of vacant land where urban services already existed or were committed. Densities got even lower because the preponderance of residential construction was for single-family homes or large suburban lots. Densities were also getting lower because of the need for large lots in locations where health and safety dictate it to accommodate use of septic tanks and wells, as well as to enable building on steeper slopes. The pattern of urban sprawl resulted in increasing dependence on the automobile. More people used the auto for more purposes at ever greater distances.

In recent years, these trends have begun to reverse as a result of limited land availability, high housing costs and mortgage interest rates, and other factors. This program (commonly known as "compact growth") was proposed as part of the draft Environmental Management Plan for the Bay Area, and was overwhelmingly rejected by the regional and local policy boards evaluating the draft plan.

This measure would reduce auto dependency and thereby improve air quality. Sixteen specific policies and 49 actions were identified that indicate what government agencies would need to do to alter development patterns to bring about more compact development. The policies and actions include adopting urban services areas, extending development consistent with those areas, building on bypassed land within existing areas. They also involve encouraging densities consistent with earlier local practice (e.g. the 1900s and 1930s), and would allow in certain instances mixed residential, commercial and industrial areas. They also would mean adopting programs to reduce the imbalance between jobs and housing throughout the region, so that distances between jobs and homes can be shortened. The compact growth policies and actions described in this chapter would reduce automobile emissions and improve air quality. They are a more precise statement of the city-centered policy adopted by the ABAG General Assembly in the Regional Plan of 1970 and the General Assembly's growth policy actions of 1973 and 1974. Some of the policies and actions are already being carried out by some local jurisdictions in the Bay Area. Not all actions would be required of every city and county--or every public agency involved. Specific actions would be determined in cooperation with the jurisdictions involved in subsequent years of the continuing planning process.

The effects of land use controls on air quality could be significant. Preliminary estimates indicate that hydrocarbon emission reductions on the order of 20 tons per day could be achieved by the year 2000.

The policies and actions are as follows:

Policy A: Extend new development only to those locations with existing sewer and water service or sewer and water service committed in capital improvement programs.

Action 1: Local Agency Formation Commissions (LAFCOs) adopt city and special district spheres of influence throughout the region as soon as possible.

Action 2: LAFCOs adopt the "urban service area" concept for defining urban service commitments and projecting urban land needs for 5, 10 and 20 year periods

Action 3: LAFCOs approve annexations and formation of cities and special districts consistent with Action 2 findings on urban service commitments and urban land needs

Action 4: Counties and cities enact non-urban zoning outside urban service areas.

Action 5: Counties and cities enact temporary moratoria on urban zoning and subdivisions outside urban service areas pending the enforcement of non-urban zoning in such areas

Policy B: Restrict development outside urban service areas in areas of critical environmental concern (environmental resources, hazards, or amenities).

Action 6: Counties and cities enact agricultural zoning or large-lot rural residential zoning (generally one dwelling unit per 40 acre minimum lot size

Action 7: Counties and cities initiate, continue or expand programs under the California Land Conservation Act (Williamson Act), the Open Space Easement Act of 1974 and the Z'berg-Warren-Keene-Collier Forest Taxation Reform Act of 1976 outside urban service areas.

Action 8: Counties and cities establish programs of public land management (including acquisition, purchase/leaseback, purchase/transfer of development rights, etc.) for locations outside urban service areas.

Policy C: Develop unimproved land within urban service areas where urban services exist or are committed in capital improvement programs.

Action 9: ABAG, counties, cities and LAFCOs establish "early warning" inter-agency information exchange programs concerning urban service facility plans at the earliest stages of project planning.

Action 10: Expedite city, county, LAFCO or ABAG project reviews where needed information on service capacities has been provided under Action 9 above.

Action 11: Counties and cities initiate rezoning and permit preference procedures in locations with existing but unused service capacities (with emphasis on water, sewer, transportation and school services)

Policy D: Complete, as soon as possible, all needed sewer, water or transportation service improvements within adopted urban service areas.

Action 12: LAFCOs review all city, county, or special district sewer, water, or transportation service capital improvement programs and report on priority needs within each urban service area

Action 13: ABAG review sewer, water and transportation needs within all urban service areas to determine regionwide priorities among such service needs.

Action 14: ABAG favorably review applications for State/Federal financial assistance from agencies lacking service capacity within urban service areas, where other existing or committed services have been found by the LAFCO to be capable of accommodating additional development

Policy E: Improve highway, street, road and transit systems consistent with local actions to stage land development.

Action 15: Counties and cities enact planning and zoning regulations to stage land development consistent with the scheduling of urban services (including but not limited to "development sequence zoning", "tiered zoning districts", development timing permits etc.).

Action 16: Caltrans, MTC, counties, cities, and special districts plan, program, fund and construct highway, street, road and transit improvements consistent with local action to stage land development.

Policy F: Increase housing and job opportunities in existing urbanized areas by encouraging public and private rebuilding into compatibly mixed commercial, industrial and residential land uses.

Action 17: Counties and cities initiate and/or expand housing conservation programs in existing urbanized areas.

Action 18: Counties and cities initate and/or expand commercial and industrial development and redevelopment in existing urbanized areas.

Action 19: Counties, cities and special districts initiate and/or expand incentives to public and private redevelopment in urbanized areas. Emphasis would be on sewer and water facilities, and extensive transit service improvements, but should also include educational and cultural facilities and public safety service improvements where appropriate.

Action 20: ABAG, counties and cities analyze possible local revenue reforms to provide adequate financial resources to carry out Action 19.

Action 21: ABAG support State legislation to provide local governments with adequate fiscal resources to carry out Action 19.

Action 22: ABAG oppose Federal and State legislation that would hamper the ability of local governments to carry out rebuilding programs to increase job and housing opportunities in existing urbanized areas.

Policy G: Encourage "infill" development of bypassed vacant land within urban service areas.

Action 23: Counties and cities undertake planning studies to inventory bypassed land, identify development problems, and resolve questions of best potential use.

Action 24: Counties and cities adopt necessary changes in zoning and permit procedures to facilitate development of bypassed parcels affected by special conditions.

Action 25: Service agencies design sewer, water and transportation systems to improve accessibility and service ability of bypassed vacant land in existing urban communities.

Policy H: Develop at higher densities within service areas where existing or committed urban service capacities, including transit, can support the higher densities.

Action 26: In urban service areas with adequate sewer, water and transit capacities, counties and cities rezone appropriate locations to permit higher densities.

Action 27: Counties and cities enact ordinances (such as those for planned unit development or cluster zoning) to foster higher densities on appropriate sites.

Policy I: Limit development of land within urban service areas where soil, slope, or other conditions can support only low-density development.

Action 28: Counties, cities and special districts deny primary urban services to these locations by excluding them from capital improvement programs and design of service systems, and by enactment of hookup moratoria, etc.

Action 29: Counties, cities, and special districts establish programs of public land management (including but not limited to public land acquisition, purchase/transfer of development rights, purchase/leaseback, etc.) to maintain appropriate sites in open uses.

Policy J: Improve the balance of jobs and housing in jurisdictions throughout the region to reduce the necessity for long distance home-to-job travel.

Action 30: Cities and counties adopt programs to increase local employment opportunities if a substantial proportion of their residents work elsewhere.

Action 31: Cities and counties adopt programs to increase local housing opportunities in a price range suitable for their work forces if a substantial proportion of their work forces live elsewhere.

Action 32: ABAG conduct A-95 and EIR reviews to support local government efforts to improve the balance of jobs and housing in communities throught the region.

Action 33: ABAG support State and Federal funding allocations for facilities and programs offering incentives to economic development or housing development in appropriate jurisdictions.

Policy K: Mix residential/commercial and industrial development in communities throughout the Bay Region.

Action 34: Counties and cities revise zoning ordinances to allow compatible mixtures of land uses with adequate design or performance standards (including planned unit developments, performance standard zoning, etc.).

Action 35. Counties and cities expand application of conditional use permits where appropriate.

Policy L: Discourage new large-scale land development projects that are exclusively commercial, industrial or residential, unless such projects clearly demonstrate that they improve the overall balance of jobs and housing in that city, county, or subregion.

Action 36: Counties, cities and LAFCOs deny incorporation or annexation of large-scale development proposals that are exclusively commercial, industrial or residential, unless such incorporation or annexation can be shown to improve the overall balance of jobs and housing in the city, county, or subregion.

Action 37: MTC, the California Department of Transportation and transportation districts deny regional transportation system access or extension to proposed large-scale land development projects that are exclusively commercial, industrial or residential unless such transportation actions can be shown to improve the overall balance of jobs and housing in the city, county or subregion.

Policy M: Fund new wastewater and transportation facilities only after areas serviced have taken actions recommended in the plan.

Action 38: The State Water Resources Control Board and the Environmental Protection Agency require applicants for wastewater facilities under Section 201 of the Federal Water Pollution Control Act to demostrate, prior to construction funding, that specific actions (including but not limited to land development regulations, urban service commitments, etc.) have been taken by affected jurisdictions to carry out actions of this plan.

Action 39: The U.S. Department of Transportation, the California Transportation Commission, the California Department of Transportation and the Metropolitan Transportation Commission require applicants for transportation improvement grants to demonstrate, prior to funding for acquisition and construction that specific actions (including but not limited to land development regulations, urban service commitments, etc.) have been taken by affected jurisdictions to carry out actions of this plan.

Policy N: Review development proposals for air quality effects and consistency with compact development (indirect source review).

Indirect sources of air pollution are sources that do not directly emit pollutants, but which include emissions from other sources (primarily motor vehicles). An Indirect Source Review program would be used for two purposes: First, to ensure consistent application of the compact development policies; and second to prevent localized carbon monoxide problems in the vicinity of the indirect source.

The types of new or modified sources to be reviewed for approval under this measure would include, but would not be limited to, the following:

- Highways and roads;
- Parking facilities;

- Retail, commercial, and industrial facilities,
- Recreation, amusement, sports, and entertainment facilities;
- Airports,
- Office and government buildings;
- Apartment and condominium buildings;
- Education facilities.

The above sources would include most large projects.

The review procedure would be limited, however, to developments above certain size thresholds, specified in terms of daily traffic volumes for highways, annual aircraft operations for airports, and number of parking spaces for most other facilities. Indirect sources smaller than the threshold sizes are assumed to be evaluated and controlled as part of the overall compact development strategy.

> Action 40: ABAG, BAAPCD and MTC adopt memoranda of understanding and procedures for prompt and thorough joint review of significant development proposals. Review would be conducted for proposals (such as shopping centers, industrial parks, office complexes, etc.) where significant air pollution could result from the project's generation of auto traffic.
>
> Action 41: BAAPCD adopt permit procedures for application to indirect sources.
>
> Action 42: ABAG encourage and support local government efforts to determine direct and indirect effects on air quality in making local land use decisions. Such support shall include technical assistance and analysis.
>
> Action 43: ABAG and MTC encourage and support local government efforts to reduce adverse effects of development proposals on air quality, including but not limited to assistance in identifying and implementing mitigation measures for adverse impacts of municipal wastewater facilities and transportation improvement programs.

Policy O: Adopt financial programs to support local and regional agency actions and private sector development actions consistent with policies in this chapter to reduce home-to-work distance and auto dependency.

> Action 44: ABAG, counties and cities support State and Federal legislation to provide subventions and other fiscal assistance to cities and counties carrying out development policies to achieve air quality standards.
>
> Action 45: ABAG, counties and cities support State and Federal legislation providing tax incentives to the private sector for rebuilding and development within existing urbanized areas.
>
> Action 46: ABAG, counties and cities support State and Federal legislation providing financial support to local and regional agencies for carrying out development management policies and reviews to achieve air quality standards, especially to mitigate adverse impacts on low- and moderate-income households.

Policy P: Adopt a coordinated regionwide program for carrying out actions for attainment and maintenance of air quality standards through development and land use management actions by cities, counties, special districts, ABAG, BAAPCD, MTC, LAFCOs and other appropriate local and regional agencies.

> Action 47: ABAG identify, within six months of General Assembly adoption of an initial air quality maintenance plan, which implementing actions are being carried out by local and regional agencies.
>
> Action 48: ABAG include, in each annual revision of the AQMP, agreements reached among local and regional agencies for carrying out land use and development management actions included in the initial AQMP.
>
> Action 49: ABAG shall include, in each annual revision of the AQMP, an identification of actions not being carried out by all appropriate agencies, and which actions are to be carried out by appropriate agencies by the next annual revision of the AQMP.

CONTROL MEASURE NAME: INDIRECT SOURCE REVIEW (MANDATORY)

COST EFFECTIVENESS: UNKNOWN

YEAR OF ADOPTION: 1983

DESCRIPTION OF CONTROL MEASURE:

This measure would require review of development projects, such as shopping centers, which generate or attract traffic. Indirect sources are those uses such as listed below, which produce no significant air contaminant emissions themselves but do attract large volumes of traffic which can lead to air quality problems. Mitigation measures would be required if projected emissions from traffic generated by any project--or cumulative with nearby projects--would exceed air quality standards. Such measures would be most effective if introduced early in the planning and design stages. Cooperation of local governments and transit agencies would be essential for effective implementation of some mitigation measures.

This mandatory review process would replace "Advisory Review of Projects and Plans" for indirect sources above specified size criteria. A new category of Authority to Construct permits would be issued to applicant-developers by the BAAQMD. As an alternative mechanism, each city and county in the District could amend its building permit regulations to include air quality requirements according to uniform standards. In the latter case, the local applications would be reviewed by BAAQMD or by the three co-lead air quality planning agencies. Comments on the permits would then be forwarded to the cities and counties for their final permit actions.

This measure would help to achieve attainment, as well as ensure long-term maintenance of federal standards for carbon monoxide, ozone, and particulate.

Only large development projects would be subject to review. The threshold values would be set for various kinds of projects and plans, based upon the number of vehicle trips which would be generated. Some examples are:

Residential development	200 dwelling units
Parking lot or garage	200 spaces
Shopping areas	100,000 sq. ft. gross floor area
Hotel	400 rooms
Theater	800 seats
Local plans*	affecting 10 acres
Airports, stadiums, freeways, ports/marinas, quarries, transit programs.	all

*Government actions such as area plans and extension of urban service areas.

These thresholds are based on estimated approximations of the emission levels for stationary sources which trigger the new source review process, including requirements for BACT and offsets. Final threshold values would be chosen based upon desired stringency vs. administrative costs.

In 1979 the BAAQMD adopted an indirect source review regulation, following a federal requirement. Threshold levels at that time were much higher (1,000 dwelling units, 1000 parking spaces, etc.); and both the federal and local requirements were dropped within two weeks. Thus there is no actual local experience with the control measure.

CONTROL MEASURE: INCREASE PUBLIC SUPPORT FOR TRANSIT

EMISSION ESTIMATES: IF ACHIEVED, THIS MEASURE WOULD COMPLEMENT TCM #3 AND AID IN ACHIEVING THE EMISSION REDUCTIONS IDENTIFIED UNDER THAT MEASURE.

COST EFFECTIVENESS: UNKNOWN

YEAR OF ADOPTION: 1982

DESCRIPTION OF CONTROL MEASURE:

The Bay Area, like other regions in the nation, requires large public subsidies to fund their transit operations. In fiscal year 1980-81, Federal assistance of $41 million covered 9% of the costs of this region's transit operations. The current administration plans to phase out transit operating assistance by 1985. The transit operators are trying to maintain services by cutting costs through productivity improvements. In addition, most operators are raising fares this year. However, the ability to obtain additional non-Federal revenues to replace the Federal cuts is severely limited. MTC recommends that, rather than cutting out Federal subsidies altogether, Congress should adopt a new formula for distributing the monies that is largely based on service factors.

The administration has expressed a commitment to continued funding of bus and railcar replacement and related capital projects. A recent analysis revealed that local transit operators will need $800 million between 1981-85 just to sustain and modernize the existing capital plants. If transit operators are to make a dent in these costs, their capital funding must at least be maintained at historic levels. Unfortunately, it appears that reductions are also being made in this program. The administration is also seeking to eliminate funds for transit expansion. Bay Area projects which are threatened by this include planned BART extensions and the Guadalupe light rail line. MTC recommends that the bus and rail modernization and the new starts programs should be reauthorized.

ADDITIONAL TRANSPORTATION CONTROL MEASURES IDENTIFIED BY THE CALIFORNIA AIR RESOURCES BOARD FOR CONSIDERATION IN THE DRAFT 1982 PLAN

The following transportation control measures (TCMs) have been implemented in various cities in the United States and Canada. Each example is summarized and a reference and/or contact person is given. Some of the TCMs listed are already being implemented in the Bay Area in some form or in limited areas (i.e., by some cities or counties). They are presented here because they are good examples which may aid in strengthening the Bay Area programs.

I. EMPLOYER TRANSPORTATION PROGRAMS

General Comments

Employer transportation programs have been successful in reducing the number of single occupancy vehicles (SOV) trips, and their development in the Bay Area should be encouraged. The Santa Clara Manufacturers Association has already initiated a rideshare program. We propose that MTC identify other areas where public or private employer programs could be formed. It is especially important for each area to set strong target goals as did the El Segundo Employers Association to reduce SOV trips.

1. South Placer County Trip Reduction Ordinances

Local jurisdictions in South Placer County have adopted ordinances that generally require existing and new employers of 200 plus employees to develop plans to reduce commute vehicle trips by 30% and to designate transportation coordinators. To our knowledge, these are the only ordinances to focus on a trip reduction target. The local jurisdictions have also established a regional transportation coordinator's office under a joint powers agreement, with authority over employer trip reduction activities. The South Placer ordinance followed the model presented in Ridesharing As An Air Pollution Control Measure by D. L. McNerny and M. H. Scheible (ARB). A copy

of this publication and one of the South Placer County ordinances are enclosed.

Reference: South Placer Policy Committee. "Report to the California Transportation Commission", May 28, 1982. (excerpt enclosed)

2. Denver, Colorado

The Denver ordinance to reduce air pollution resulting from emissions from single occupancy automobile travel encourages public transit, ridesharing, and other emission reduction modes of travel. Every major employer and business landlord in the area must submit a written compliance plan for each business location with 100 or more employees or 250 or more tenants. Employers are required: (1) to disseminate information about carpool matching service, RTD routes, and bike routes; (2) to establish auto and bike parking facilities; (3) to provide a guaranteed space for each carpool and/or vanpool; (4) to provide an adequate number of bicycle parking facilities if parking for motor vehicles are provided or subsidized.

Reference: Regulation No. 9, "The Reduction of Automobile Air Pollution in the Denver Region through the Encouragement of Travel to and from Work by Public Transit, Ridesharing, and other Emissions. Reducing Travel Modes." (copy enclosed)

3. Tyson's Corner, Virginia

Tyson's Corner, a large development in suburban Virginia 12 miles west of Washington, D. C., employs 25,000 workers who commute in 20,000 autos. To alleviate congestion, fifty of Tyson's largest corporations formed the Tyson's Transportation Association (TTA) to provide a comprehensive ridesharing coordination, a mid-day shuttle service for employee lunch hours, and vanpool coordination. In the future, new development permits will be conditional on several commitments by the developer such as estimated ridesharing program, pay parking to encourage pooling, bus shelters, shuttle services, etc..

Reference: Letter from Eric Schreffler, Center for Transportation Studies, MIT, 77 Massachusetts Avenue, Cambridge, Massachusetts 02139.

4. El Segundo, California

The El Segundo Employers Association (ESEA) was established in 1981 by employers in the El Sequndo/Los Angeles International Airport area to design solutions to that area's transportation problems. A goal of 50% participation in the Association's carpooling program has been suggested as reasonable.

Reference: Talk given at "California Commuting Cyclist Conference" by Don Torluemke, Executive Director, ESEA. El Segundo Employers Association Annual Report, 1981-82. (copy enclosed)

II. TRANSIT

1. Telephone Information Systems

A computerized telephone access program has been installed in Columbus, Ohio, San Diego, California, and a number of Canadian cities. Its purpose is to reduce uncertainty and wait time at bus stops by computerizing bus schedules and quickly providing arrival times to the public. Aimed at the occasional user, it is particularly effective in increasing off-peak ridership; i.e., the off-peak ridership has been increased by 19.7% in Ottawa. Briefly, the system operates as follows:

1. Each bus stop has a phone number.
2. A caller dials the bus stop number from home.
3. The computer searches the schedule.
4. A computerized voice relays the arrival times of the next several buses for that stop.

The system responds quickly with no delays and can handle as many as 22,000 calls a day.

Contact: Jim Schmidt
Teleride Corporation
Fox Plaza, Suite 208
1390 Market Street
San Francisco, CA 94102

III. BICYCLES

General Comments

Bicycles are a non-polluting alternative to motorized vehicles. A number of cities such as Palo Alto have included the development of bicycle facilities in the city plans and zoning ordinances. MTC could work with other cities and counties to encourage the inclusion of bicycle facilities in local ordinances.

1. Palo Alto, California

The City of Palo Alto Zoning Ordinance states that "bicycle facilities shall be provided for any new building constructed and for any new use established, for any addition or enlargement of an existing building or use, and for any change in the occupancy of any building or the manner in which any use is conducted that would result in additional (motorized vehicle) parking facilities being required..." Depending on the type of land use, safe bicycle parking is provided in the amount of 10% of that provided for automobiles. For recreation areas, bicycle parking is provided in the amount of 30% of that provided for automobiles.

Reference: City of Palo Alto. "Zoning Regulations," March, 1978.

2. Santa Barbara, California

The Santa Barbara Metropolitan Transit District (SBMTD) initiated a Bike-Bus Service to provide bicyclists with long distance door-to-door transportation. A person can bicycle to the bus stop, load the bike on a minibus trailer, travel by bus, and unload the bike

for use at his/her destination. In addition, bike storage will also be provided at bus stops.

Contact: Gary Gleason
Project Manager
Santa Barbara Metropolitan Transit District
P. O. Box 355
Santa Barbara, CA 93102

3. Davis, California

In 1966, Davis adopted a city plan stating that bicycle facilities will be considered in the design of all arterials and collector streets. Davis is one of the few cities with a complete bike lane system. Approximately forty miles of Class I and II lanes have been constructed providing bicycle access to all parts of town. It is estimated that 25 percent of all trips are by bicycle in Davis.

Reference: City of Davis. General Plan.
EPA. Bicycling and Air Quality Information Document. September, 1979.

4. Monterey, California

The Air Quality Plan prepared by AMBAG in 1978 estimated a 0.04 tons/day reduction in emissions could be achieved in 1981 if the use of bicycles increased as a form of transportation. A survey of four Monterey businesses indicated that a 2.8% mode-shift to bicycles occurred with the provision of bicycle parking facilities at these businesses. The mode-shift resulted in a reduction of 431.7 driven vehicle miles traveled (DVMT). It was estimated that this reduction in DVMTs reduced carbon monoxide, hydrocarbons, and mitrogen oxides by .0017, .0116, and .0019 tons/day, respectively for the four businesses. If bicycle facilities were installed throughout the area, this could result in a substantial reduction in auto emissions for the region.

Reference: AMBAG Bicycle Commuting and Air Quality. April, 1981.

5. Livermore, California

Under the direction of Don Torluemke, the Lawrence Livermore Laboratory achieved a 10% bicycle ridership. Torleumke, now executive director of the El Segundo Employees Association, has set similar goals for that area.

6. Sacramento, California

The Sacramento bikelane system is not complete. As the system develops, the number of bicyclists using the system increases. One and five-tenth percent of state employees in Sacramento bicycled to work in 1979. In 1982, 4.2 percent of employees commuted to work by bike.

Reference: Office of Facilities, Planning, and Development. Status Report: Transportation Management in the Capitol Area. March, 1982.

IV. PARKING

1. Los Angeles, California

The City of Los Angeles parking management program allows a company to provide less than code required parking if the company accepts full responsibility for providing and maintaining ridesharing alternatives.

Contact: Graham O. Smith
Office of the Mayor
Room 1400, City Hall
Los Angeles, CA 90012
(213) 48503365

2. Portland, Oregon

The purpose of the Portland ridesharing program is to increase ridesharing through promotion schemes, parking incentives, and direct contact with employers. It is estimated that this results in a reduction of 376,213 vehicle miles traveled daily, 24,493

gallons of gas daily, and 3,480 tons of vehicle emissions a year. Although the program includes a number of measures, there are two specific parking items that deserve consideration: (1) administering the downtown parking permit program whereby preferential parking is given to carpools for only $15 per month, and (2) operating preferential on-street carpool parking program. We feel that both of these items could be implemented in the Bay Area.

Reference: Schwartz & Connally, Inc., Innovative and Successful Transportation Control Programs. December, 1980. (copy enclosed)

3. Sacramento, California

In order to fulfill one of the transportation control measures mandated by 1979 Regional Air Quality Plan, Sacramento City and County formed the Parking Management and Alternative Program. The purpose of the program is to discourage auto driving and encourage alternate modes of travel. This will be accomplished by one or both of the following strategies: (1) to eliminate the use of 1850 parking spaces or to enact pricing and supply limitation measures; and (2) to limit the availability of long term parking during the peak commute.

Reference: City and County of Sacramento. Parking Management and Alternative Transportation Incentive Program. January, 1981.

V. FLEX TIME

1. Seattle, Washington

The Seattle-King County Commuter Pool surveyed employees in the Seattle area after flex time was instigated at their place of employment. The data indicated that 6 percent of the employees shifted their commute time to an earlier hour. It was estimated that large scale adoption of flex time could increase the "effective transportation system capacity" by approximately 11%.

Reference: Harrison, F.D., "Flexible Work Hours and Commuting Choices: Survey Results from Downtown Seattle." Available from Seattle-King County Commuter Pool, 704 Third Avenue, Seattle, Washington 98104.

VI. LAND USE MEASURES

1. CTRPA Indirect Source Review

In 1977, the California Tahoe Regional Planning Agency established standards and procedures for reviewing and approving new indirect sources of air pollution. New businesses that are indirect sources of air pollution must mitigate the air quality impact as a condition for receiving a permit. Emissions must be mitigated to the amount of 1.5 times that produced by the indirect source, or emission fees will be charged. The fees are used for programs such as improved transit.

Reference: California Tahoe Regional Planning Agency. Indirect Source Review. (copy enclosed)

2. Saratoga, California

The City of Saratoga has adopted a policy to deny all applications for new developments incorporating a drive-up facility. The purpose of the ordinance is to reduce fuel consumption, air pollution, and the use of the automobile, as well as to preserve the rural nature of the city.

Reference: Planning Commission of the City of Saratoga, "A Resolution Adopting A Policy Barring Inclusion of Drive-Up Facilities in New Developments Within the City of Saratoga" (Resolution No. PC-125).

VII. FLEET MANAGEMENT

1. GasCAP (Gasoline Conservation Awareness Program)

GasCAP is a fuel conservation program that enables an organization to provide its basic service but at the same time conserve fuel. In concept, the program saves fuel and costs by modifying behavior patterns of the employee drivers and by upgrading maint nance and management procedures. A minimum of 10% fuel savings has been achieved in organizations where this program has been implemented. The program has air quality benefits in emphasizing reducing cold starts through trip management and in maintaining engines in good repair.

Reference: "GasCAP - General Information." Unpublished report by West Valley College.

VIII. VOLUNTARY AND INTERMITTANT DEVICES

1. Ventura, California

Ventura's air quality plan includes: (1) enforcement of controls on major stationary sources and employers of 100 or more employees for predicted days of high ozone concentrations; (2) education of the public to reduce voluntarily the use of motor vehicles, utility equipment, and pesticides during high ozone days; (3) three voluntary transportation/land use measures; (a) encouraging local colleges to reduce fees for those who rideshare and including ridesharing forms in registration packets; (b) encouraging local governments to reduce parking requirements for new or modified facilities for employers who encourage ridesharing; (c) requesting ridesharing coordination among groups of small

employers; (4) a provision that future revision of the county's land use planning program will include transportation efficiency in relation to air quality as a key component of the decision making process.

2. Santa Barbara, California

Santa Barbara either has implemented or is considering the following measures in its air quality plans: (1) street signs at busy intersections recommending shutting off car engines; (2) ban on drive-up windows; (3) standard mitigation measures for new development; and (4) transportation system subsidies from new source offsets.

3. Fresno, California

Fresno has adopted an indirect source review program consisting of an improved CEQA air quality review.

4. Sacramento, California

Sacramento's air quality plan includes: (1) voluntary subsidizing of bus fares by employers; (2) encouraging flex time; (3) discouraging large homogeneous land use patterns; and (4) direct public education on improvement of air quality by individuals.

MTC STAFF RESPONSE TO THE ARB PROPOSALS

I. Employer Transportation Programs

A number of employer programs are underway in the Bay Area. RIDES has an outreach program directed at major employers. MTC conducts the Commute Alternatives Program, which trains coordinators to aid employees of their firms. These programs are included in the draft recommendations as TCM's 5 and 9.

There are no jurisdictions in the Bay Area with a ridesharing ordinance directed at major employers. At the present time, it appears that the response to the voluntary programs is fairly good. In addition, the administrative costs are reasonable. It may be appropriate, however, to consider a ridesharing ordinance as a contingency measure, to be enacted if the response to the voluntary programs drops off.

II. Transit

Transit measures were included in the Plan as TCM's 1, 2, 3, and 6. The transit operators individually and collectively have various information programs--including schedules, maps, telephone information, computerized district listings shared by all information centers, and regional transit guides. A telephone information system, as described in the ARB proposal, has been explored and determined not yet to be cost-effective in this region.

III. Bicycles

MTC has developed a draft regional bicycle plan which does call for development of a model ordinance for cities. The bike plan is scheduled for adoption in September of this year (1982).

IV. Parking

There are a number of preferential parking programs in the Bay Area. These were discussed in Chapter 2 of the Plan. A measure encouraging cities to reduce parking requirements for employers who promote ridesharing is included as TCM 10.

V. Flex Time

Flex time can be an effective measure; it is included in the Plan as TCM 12.

VI. Land Use Measures

An advisory indirect source review program is included in the draft Plan. In addition, a mandatory program was recommended by the Joint Air Quality Planning and Advisory Committee for consideration. Discouraging drive-up facilities is also included in the Plan as TCM 13.

VII. Fleet Management

TCM 14 addresses idling controls for delivery fleet operators and TCM 15 covers alternative engines and fuels.

VIII. Voluntary and Intermittant Devices

A program which calls for voluntary reductions in travel on high ozone days may have potential air quality benefits, even though no credit can be claimed in the air quality plan. Further work is needed to better define such a program.

APPENDIX D

CONTROL MEASURES CONSIDERED NOT REASONABLY AVAILABLE

CONTROL MEASURES CONSIDERED NOT REASONABLY AVAILABLE

The following measures were considered in the development of control alternatives, but are not recommended. As described below, these measures are not considered to be reasonably available for attainment of the federal ozone and/or carbon monoxide standards.

Stationary Source Controls

Lawnmowers--Ban use of gasoline powered lawnmowers on high ozone days--Difficult to enforce; could be voluntary. (BAAQMD Control Measure No. 18-B.)

Farm Tractors--Require (hardware) controls on new gasoline tractors--would require ARB to set statewide emissions limits; manufacturers would have to redesign specifically for California market; problems with state law which prohibits controls on "implement of husbandry;" difficult to enforce because no registration/licensing system. (BAAQMD Control Measure No. 20.)

Diesel Construction Equipment--Require periodic adjustment to manufacturer's specification--Operators do frequent field maintenance and adjustments for good performance (not lowest emissions); difficult to enforce because no registration system and frequent moves to different job sites, even across state lines. (BAAQMD Control Measure No. 21.)

Pleasure Boats--Ban use of 2-cycle engines on high ozone days--Difficult to enforce. (BAAQMD Control Measure No. 25-B.)

Pleasure Boats--Ban use of all internal combustion engines on high ozone days--Difficult to enforce. (BAAQMD Control Measure No. 25-C.)

Marine Lightering Retrofit--Modify vessels for vapor balance, or equivalent, to achieve 90% control--Difficult to achieve unless statewide or nationwide requirement, or dedicated fleet; safety considerations and Coast Guard jurisdiction; problems with state law. (BAAQMD Control Measure No. 26.)

Off-road Motorcycles--Ban use of off-road motorcycles on high ozone days--Difficult to enforce; could be voluntary. (BAAQMD Control Measure No. 27-B.)

Pleasure Boat Refueling--Require vapor recovery at marinas--Not technically feasible; high cost and low potential for ozone reduction. (BAAQMD Control Measure No. 34.)

Tree Replacement--Require replacement of 10% of trees on public lands in central Bay Area--Politically unpopular; costs and secondary effects unknown. (BAAQMD Control Measure No. 37.)

Plant Emission Limits--Reduce emissions from large stationary sources by 10% below present baseline--Arbitrary reduction of 10% may not be achievable; could be most expensive. (BAAQMD Control Measure No. 39.)

Airport Fuel Transfer--Require vapor recovery at airports for gasoline transfer to trucks and planes--Small emission reduction potential; technical difficulties; safety problems and FAA jurisdiction. (BAAQMD Control Measure No. 40.)

Transportation Control Measures

MTC staff looked at a wide range of transportation control measures (TCMs) within the categories listed under Section 108(F) of the Clean Air Act. In general, TCMs are ineffective for a number of reasons:

- o The vehicle fleet will be much cleaner by 1987. Thus, the vehicle travel reductions which can be achieved by many of the TCMs reduce emissions only slightly.
- o Because TCMs reduce hydrocarbons (HC) and oxides of nitrogen (NO_x) simultaneously, they have virtually no impact on ozone levels.
- o TCMs have only minor impacts on travel. The gas price increase in 1979 was quite significant, but resulted in only minor travel reductions.

MTC considered a number of transportation controls when the Air Quality Plan was first adopted in 1979. Because TCMs were not found to be effective, MTC adopted the following guideline:

> MTC policy supports measures that improve or enhance alternatives to the automobile without penalizing those dependent on the auto. These alternatives include transit, carpooling, and bicycle systems.
>
> MTC also adopted a specific guideline on pricing alternatives:
>
> Because the impact of specific pricing control measures appears quite small, MTC will consider such control measures only under certain conditions:
>
> 1. when problems of social and economic inequities in the transportation system are minimized and adequate transportation alternatives exist;
> 2. when such pricing measures are necessary to ensure that the transportation plan is feasible;
> 3. when such a measure is evaluated in detail and subjected to full-scale public hearings.

The current analysis, documented in the appendix to the Status Report to the JAQPAC in January, reaffirmed the general ineffectiveness of TCMs. Therefore, a change in the above guidelines was not justified. Accordingly, the following measures are not considered to be reasonably available:

1. Significantly increase bridge tolls
   (HC: -0.10 tons, CO: -0.80 tons, NO_x:-0.12 tons, assuming tolls increased by 30%)

2. Increase parking rates
   (HC: -0.24 tons, CO: -2.4 tons, NO_x: -0.37 tons, assuming parking rates increased by 50%)

3. Restrict parking on major streets in the morning and afternoon peaks
(HC: -0.31 tons, CO: -0.88 tons, NO_x: +0.05 tons. These are short-term impacts. Over the long term, the improved traffic flow may ultimately encourage more traffic.)

4. Substitute electric vehicles for conventionally powered vehicles
(HC: -1.5 tons, CO: -11.5 tons, NO_x: -1.0 tons, assuming 100,000 electric vehicles.)

5. Impose gas rationing
(HC: -29.9 tons, CO: -357.1 tons, NO_x: -45.7 tons, assuming supply reduced by 25%.)

APPENDIX E

EMISSION INVENTORIES, 1979-2000

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
District Emissions By Source Categories

1979 ANNUAL AVG.
BASE YEAR 1979
PRINTED:DEC 8, 1982

	TONS/DAY				
	PART	ROG	NOX	SO2	CO
PETROLEUM REFINING					
10 Refining Processes	1.3	0.1	6.4	30	0.2
11 Other Processes	0.1	5.6	--	--	--
12 Upsets,Leaks,Flaring	2.2	18	0.3	6	--
CHEMICAL MFG					
14 Nitric Acid	--	--	0.6	--	--
15 Phthalic Anhydride	--	--	--	--	--
16 Sulfur	0.1	0.1	--	22.8	12.5
17 Sulfuric Acid	0.1	--	--	22.9	--
18 Titanium Dioxide	--	0.2	--	--	18.8
19 Other Chemical Mfg	1.3	0.3	0.4	2.6	0.3
OTHER INDUSTRIAL/COMMERCIAL					
21 Photoresist	--	4.8	--	--	--
22 Pulp and Paper	1.7	0.2	0.5	--	5.5
23 Metallurgical	3.6	0.3	--	--	3.2
24 Asphaltic Concrete Plants	2.1	--	--	--	0.1
25 Concrete Batching	3.2	--	--	--	--
26 Glass and Related Products Mfg	1.9	--	--	1.4	--
27 Stone, Sand and Gravel	19.1	--	--	--	--
28 Sand Blasting	6.8	--	--	--	--
29 Cement Mfg	0.6	--	--	--	--
30 Salt	--	--	--	--	--
31 Food Preparation	8.2	--	--	--	--
32 Bakeries (Industrial)	--	1.6	--	--	--
33 Wineries, Breweries	--	0.3	--	--	--
34 Other Agricultural Processing	1.9	0.5	--	--	--
35 Farming Operations (Production)	21.7	--	--	--	--
36 Pesticides (Usage)	--	8.5	--	--	--
38 Construction Operations	100	--	--	--	--
39 Demolition Operations	0.6	--	--	--	--
40 Oil and Gas Field Operations	--	2.1	--	--	--
41 Wood Products Mfg	0.4	--	--	--	--
42 Land Farming	--	2.5	--	--	--
43 Gas Distribution	--	20	--	--	--
44 Other Industrial/Commercial	3	1.2	3.2	6.7	--
PETROLEUM REFINERY EVAPORATION					
47 Storage and Blending	--	12.2	--	--	--
48 Loading	--	2.9	--	--	--
FUELS DISTRIBUTION					
50 Bulk Plants - Storage Tanks	--	1.2	--	--	--
51 - Loading Trucks	--	3.6	--	--	--
52 Trucking	--	0.3	--	--	--
53 Filling Stations - Spillage	--	2.2	--	--	--
54 - Storage Tanks	--	6	--	--	--
55 - Filling Vehicle Tanks	--	6.4	--	--	--
OTHER ORGANIC COMPOUNDS EVAPORATION					
57 Storage Tanks - Solvent	--	1.6	--	--	--
58 - Other Organic Compounds	--	1.8	--	--	--
59 Structures Coating - High Solvent	--	23.5	--	--	--
60 - Low Solvent	--	14.4	--	--	--
61 Industrial Coating - High Solvent	--	73.7	--	--	--
62 - Low Solvent	--	1.5	--	--	--
63 Other Coating - High Solvent	--	19	--	--	--
64 - Low Solvent	--	--	--	--	--

	PART	ROG	NOX	SO2	CO
OTHER ORGANIC COMPOUNDS EVAP (Cont)					
65 Surface Coating Clean-up Solvent	--	14.6	--	--	--
66 Coatings Mfg	--	0.7	--	--	--
67 Asphalt Paving	--	5.3	--	--	--
68 Degreasers - Trichloroethane	--	--	--	--	--
69 - Trichloroethylene	--	0.5	--	--	--
70 - Other Solvents	--	7.9	--	--	--
71 Dry Cleaners - Perchloroethylene	--	10.6	--	--	--
72 - Other Solvents	--	3.2	--	--	--
73 Fiberglass Products Mfg	--	0.9	--	--	--
74 Rubber/Plastic Products Mfg	--	7.6	--	--	--
75 Printing - Rotogravure	--	6.5	--	--	--
76 - Flexographic	--	1.8	--	--	--
77 - Other Printing	--	3.5	--	--	--
78 Pharmaceuticals Mfg	--	0.7	--	--	--
79 Lightering, Marine Vessel Transfer	--	4.2	--	--	--
81 Other Organics Evaporation	--	14.2	--	--	--
COMBUSTION OF FUELS					
83 Domestic - Gas	3.2	0.7	21	0.2	4.2
84 - Liquid	--	--	0.2	0.8	0.1
85 - Solid	0.7	0.3	0.1	0.2	3.4
86 Commercial & Institutional - Gas	0.9	0.2	6.1	--	1.2
87 - Oil	--	--	0.2	0.2	--
88 Oil Refineries Ext Combust - NG	0.1	--	3.3	--	0.4
89 - Refinery Make Gas	1.5	0.5	30	3	2.2
90 - Fuel Oil	0.6	0.2	5.3	3.4	0.9
91 - Coke	--	--	0.1	0.4	--
92 Power Plants - NG fired Boilers	1.6	0.1	40.3	0.1	2.8
93 - Oil fired Boilers	6.1	0.6	58.9	50.2	3.8
94 - Coal fired Boilers	--	--	--	--	--
95 - Gas fired Turbines	--	--	--	--	--
96 - Oil fired Turbines	0.1	--	2.7	0.3	0.1
97 Asphaltic Concrete Plants - Gas	--	--	0.1	--	--
98 - Oil	--	0.1	0.6	0.2	--
99 Kilns - Gas	--	--	15.4	--	0.3
100 - Oil	--	--	0.6	1.1	0.1
101 - Coal	--	--	--	--	--
102 Turbines - Gas	0.2	0.2	7.9	0.1	1.8
103 - Oil	--	--	--	--	--
104 Reciprocating Engines - Lawnmowers	0.1	5	0.5	0.1	47.5
105 - Other Gasoline Engines	0.3	10.3	1.1	0.1	71.9
106 - Gas fueled	--	0.8	9	--	1.3
107 - Oil fueled	0.1	0.1	1	0.1	0.2
108 Orchard Heaters	--	--	--	--	--
109 Cogeneration	--	--	--	--	--
111 Other Combustion - NG	2	0.2	38.9	0.1	3.1
112 - Oil	0.1	0.1	1.3	1.2	0.1
113 - LPG	--	--	--	--	--
114 - Coke, Coal	--	--	0.1	0.7	0.4
115 - Other Fuels	0.1	--	1	1.3	0.1
BURNING OF WASTE MATERIAL					
117 Incineration - Residential	0.4	0.4	0.1	--	1.6
118 - Commercial/Institutional	0.7	0.1	0.7	0.2	0.1
119 - Industrial	0.1	--	--	--	0.1
120 Agricultural Debris Burning	0.3	0.3	--	--	1.8
121 Range/Forest Improvement Burning	--	--	--	--	0.2
122 Resource Recovery Projects	--	--	--	--	--

	PART	ROG	NOX	SO2	CO
OFF-HIGHWAY MOBILE SOURCES					
125 Construction Equipment - Gasoline	--	--	--	--	--
126 - Diesel	4.3	5	50.2	4.2	13.6
127 Steamships - Cargo & Passenger	0.3	--	2	9.3	--
128 - Tankers	0.1	--	0.5	2.1	--
129 - Military	--	--	--	0.1	--
130 Motorships (Fuel Oil) - Cargo	0.2	0.1	0.7	3.5	0.1
131 - Tankers	--	--	0.1	0.3	--
132 Motorships (Diesel) - Cargo & Tugs	0.1	1.1	1.5	0.3	0.5
133 - Tankers	--	0.1	0.2	--	0.1
134 Ferry Boats	--	--	0.1	--	--
135 Fishing Boats (Commercial)	0.1	0.4	0.7	0.1	0.3
136 Pleasure Boats - Diesel	0.1	0.5	0.6	--	0.2
137 - Gasoline (2-stroke)	--	5.8	1.2	0.1	28.5
138 - Gasoline (4-stroke)	--	5.8	1.2	0.1	28.5
139 Locomotives	0.3	1.4	4.4	0.6	1.6
TOTAL (DISTRICT JURISDICTION)	205	359	321	177	264
AIRCRAFT					
142 Air Carriers	3.7	5.2	6.5	0.7	14.7
143 General Aviation - Jet	1.7	0.4	0.5	0.1	1.9
144 - Piston	0.1	3.6	1.2	--	19.6
145 Military - Jet	0.3	1	0.8	0.1	2.3
146 - Piston	--	2.5	--	--	20.1
MOBILE SOURCES					
148 Cars & Light Duty Trucks - Exhaust	17.3	182	224	6.6	2340
149 - Evaporation	--	84.3	--	--	--
150 - Crankcase	--	2.4	--	--	--
151 - Tire/Brake Lining Wear	9.3	--	--	--	--
152 Medium Duty Gas Vehicles - Exhaust	0.9	8.2	15	0.5	105
153 - Evaporation	--	1.9	--	--	--
154 - Crankcase	--	0.3	--	--	--
155 - Tire/Brake Lining Wear	0.4	--	--	--	--
156 Heavy Duty Gas Vehicles - Exhaust	1.9	17	24.6	1.1	366
157 - Evaporation	--	2.1	--	--	--
158 - Crankcase	--	0.7	--	--	--
159 - Tire/Brake Lining Wear	0.5	--	--	--	--
160 Diesel Trucks - Exhaust	2.1	3.6	38.2	6.8	29.8
161 - Tire Wear	0.7	--	--	--	--
162 Buses - Exhaust	0.4	0.8	8	1.4	6.2
163 - Tire/Brake Lining Wear	0.1	--	--	--	--
164 Motorcycles (on-road) - 2 Stroke	0.1	2.4	--	--	5.6
165 - 4 Stroke	0.1	2.2	0.2	--	9.5
166 Motorcycles (off-road) - 2 Stroke	--	1.4	--	--	3.4
167 - 4 Stroke	--	0.7	--	--	1.[illegible]
123 Farm Tractors - Gasoline	--	0.5	0.5	--	11.8
124 - Diesel	0.2	0.4	1.8	0.2	0.6
MISC EMISSION SOURCES					
170 Accidental Wild Fires	0.7	0.8	0.1	--	4.[illegible]
171 Structural Fires	0.3	0.3	0.1	--	4.[illegible]
172 Roads - Paved	186	--	--	--	--
173 - Unpaved	5.3	--	--	--	--
80 Consumer Solvent Usage	--	41.7	--	--	--
175 Bio degradation	--	6.4	--	--	--
176 Ocean/Bay Salt	42.4	--	--	--	--
**177 Consumer Solvent Usage	--	**	--	--	--
GRAND TOTAL	479	732	643	195	3220

** Vegetation emissions are about 400 t/day as estimated by ABAG for the BAAQMD

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
District Emissions By Source Categories

1987 ANNUAL AVG.
BASE YEAR 1979
PRINTED:DEC 7, 1982

	TONS/DAY				
	PART	ROG	NOX	SO2	CO
PETROLEUM REFINING					
10 Refining Processes	1.4	0.1	7	33	0.3
11 Other Processes	0.1	3.9	--	--	--
12 Upsets,Leaks,Flaring	2.5	5.2	0.3	6.6	--
CHEMICAL MFG					
14 Nitric Acid	--	--	0.6	--	--
15 Phthalic Anhydride	--	--	--	--	--
16 Sulfur	0.1	--	--	24.8	13.5
17 Sulfuric Acid	0.2	0.1	--	24.9	--
18 Titanium Dioxide	--	--	--	--	20.5
19 Other Chemical Mfg	1.5	0.3	0.4	0.1	0.3
OTHER INDUSTRIAL/COMMERCIAL					
21 Photoresist	--	5.4	--	--	--
22 Pulp and Paper	0.9	0.2	0.5	--	5.9
23 Metallurgical	1.6	0.2	--	--	3.5
24 Asphaltic Concrete Plants	1.1	--	--	--	0.1
25 Concrete Batching	3.4	--	--	--	--
26 Glass and Related Products Mfg	2.1	--	--	1.5	--
27 Stone, Sand and Gravel	20.8	--	--	--	--
28 Sand Blasting	7.3	--	--	--	--
29 Cement Mfg	0.7	--	--	--	--
30 Salt	--	--	--	--	--
31 Food Preparation	8.9	--	--	--	--
32 Bakeries (Industrial)	--	1.8	--	--	--
33 Wineries, Breweries	--	0.3	--	--	--
34 Other Agricultural Processing	2.1	0.5	--	--	--
35 Farming Operations (Production)	21.4	--	--	--	--
36 Pesticides (Usage)	--	9.2	--	--	--
38 Construction Operations	115	--	--	--	--
39 Demolition Operations	0.7	--	--	--	--
40 Oil and Gas Field Operations	--	2.3	--	--	--
41 Wood Products Mfg	0.4	--	--	--	--
42 Land Farming	--	2.7	--	--	--
43 Gas Distribution	--	21.7	--	--	--
44 Other Industrial/Commercial	3.3	1.3	3.4	7.3	--
PETROLEUM REFINERY EVAPORATION					
47 Storage and Blending	--	12.5	--	--	--
48 Loading	--	3.2	--	--	--
FUELS DISTRIBUTION					
50 Bulk Plants - Storage Tanks	--	0.9	--	--	--
51 - Loading Trucks	--	2.9	--	--	--
52 Trucking	--	0.2	--	--	--
53 Filling Stations - Spillage	--	1.9	--	--	--
54 - Storage Tanks	--	5.1	--	--	--
55 - Filling Vehicle Tanks	--	5.5	--	--	--
OTHER ORGANIC COMPOUNDS EVAPORATION					
57 Storage Tanks - Solvent	--	1	--	--	--
58 - Other Organic Compounds	--	2	--	--	--
59 Structures Coating - High Solvent	--	--	--	--	--
60 - Low Solvent	--	24	--	--	--
61 Industrial Coating - High Solvent	--	15.3	--	--	--
62 - Low Solvent	--	26	--	--	--
63 Other Coating - High Solvent	--	20	--	--	--
64 - Low Solvent	--	0.3	--	--	--

	PART	ROG	NOX	SO2	CO
OTHER ORGANIC COMPOUNDS EVAP (Cont)					
65 Surface Coating Clean-up Solvent	--	7.4	--	--	--
66 Coatings Mfg	--	0.7	--	--	--
67 Asphalt Paving	--	3.9	--	--	--
68 Degreasers - Trichloroethane	--	--	--	--	--
69 - Trichloroethylene	--	0.5	--	--	--
70 - Other Solvents	--	7.9	--	--	--
71 Dry Cleaners - Perchloroethylene	--	5.4	--	--	--
72 - Other Solvents	--	1.1	--	--	--
73 Fiberglass Products Mfg	--	0.6	--	--	--
74 Rubber/Plastic Products Mfg	--	7.6	--	--	--
75 Printing - Rotogravure	--	2.2	--	--	--
76 - Flexographic	--	0.5	--	--	--
77 - Other Printing	--	3.1	--	--	--
78 Pharmaceuticals Mfg	--	0.3	--	--	--
79 Lightering, Marine Vessel Transfer	--	3.9	--	--	--
81 Other Organics Evaporation	--	10.5	--	--	--
COMBUSTION OF FUELS					
83 Domestic - Gas	3.5	0.8	22.8	0.2	4.6
84 - Liquid	--	--	--	0.2	--
85 - Solid	0.9	0.3	0.1	0.2	4.3
86 Commercial & Institutional - Gas	0.9	0.2	6.7	--	1.3
87 - Oil	--	--	0.1	0.1	--
88 Oil Refineries Ext Combust - NG	0.1	--	3.6	--	0.4
89 - Refinery Make Gas	1.6	0.6	33	3.3	2.4
90 - Fuel Oil	0.7	0.2	5.8	3.7	1
91 - Coke	--	--	0.1	0.5	--
92 Power Plants - NG fired Boilers	2.8	0.1	69.3	0.2	4.7
93 - Oil fired Boilers	2.3	0.2	21.7	18.5	1.4
94 - Coal fired Boilers	--	--	--	--	--
95 - Gas fired Turbines	--	--	--	--	--
96 - Oil fired Turbines	0.1	--	3.1	0.4	0.2
97 Asphaltic Concrete Plants - Gas	--	--	0.1	--	--
98 - Oil	--	0.1	0.6	0.3	--
99 Kilns - Gas	--	--	0.3	--	0.1
100 - Oil	--	--	0.1	0.4	--
101 - Coal	0.3	0.1	11.7	4.8	0.3
102 Turbines - Gas	0.2	0.2	8.6	0.1	1.9
103 - Oil	--	--	--	--	--
104 Reciprocating Engines - Lawnmowers	0.1	3.8	0.5	0.1	41.9
105 - Other Gasoline Engines	0.4	12	1.3	0.1	83.5
106 - Gas fueled	--	0.8	9.3	--	1.3
107 - Oil fueled	0.1	0.1	1.1	0.1	0.2
108 Orchard Heaters	--	--	--	--	--
109 Cogeneration	0.9	0.6	9.4	0.1	6.6
111 Other Combustion - NG	2.2	0.2	42.5	0.1	3.4
112 - Oil	0.2	0.1	1.4	1.3	0.1
113 - LPG	--	--	--	--	--
114 - Coke, Coal	--	--	0.1	0.7	0.4
115 - Other Fuels	0.1	--	1.1	1.4	0.1
BURNING OF WASTE MATERIAL					
117 Incineration - Residential	0.5	0.5	0.1	--	1.9
118 - Commercial/Institutional	0.4	0.1	0.8	0.3	0.1
119 - Industrial	0.1	--	--	--	0.1
120 Agricultural Debris Burning	0.3	0.3	--	--	1.8
121 Range/Forest Improvement Burning	--	--	--	--	0.2
122 Resource Recovery Projects	0.6	0.3	5.7	2.5	11.6

	PART	ROG	NOX	SO2	CO
OFF-HIGHWAY MOBILE SOURCES					
125 Construction Equipment - Gasoline	--	--	--	--	--
126 - Diesel	4.8	5.6	56	4.7	15.2
127 Steamships - Cargo & Passenger	0.3	--	2.1	10.2	--
128 - Tankers	0.1	--	0.5	2.2	--
129 - Military	--	--	--	0.1	--
130 Motorships (Fuel Oil) - Cargo	0.2	0.1	0.8	3.9	0.1
131 - Tankers	--	--	0.1	0.4	--
132 Motorships (Diesel) - Cargo & Tugs	0.2	1.1	1.6	0.4	0.5
133 - Tankers	--	0.1	0.2	--	0.1
134 Ferry Boats	--	--	0.1	--	--
135 Fishing Boats (Commercial)	0.1	0.4	0.8	0.1	0.3
136 Pleasure Boats - Diesel	0.1	0.3	0.7	0.1	0.3
137 - Gasoline (2-stroke)	--	6.3	1.3	0.1	31
138 - Gasoline (4-stroke)	--	6.3	1.3	0.1	31
139 Locomotives	0.3	1.5	4.8	0.7	1.7
TOTAL (DISTRICT JURISDICTION)	221	275	344	161	301
AIRCRAFT					
142 Air Carriers	4.2	4.4	8.7	0.8	15.9
143 General Aviation - Jet	2.6	0.7	0.8	0.2	2.8
144 - Piston	0.1	4	1.3	--	21.7
145 Military - Jet	0.4	1.3	0.9	0.2	3
146 - Piston	0.1	3.7	--	--	30.1
MOBILE SOURCES					
148 Cars & Light Duty Trucks - Exhaust	13.3	103	138	5.8	1400
149 - Evaporation	--	40.8	--	--	--
150 - Crankcase	--	--	--	--	--
151 - Tire/Brake Lining Wear	10.1	--	--	--	--
152 Medium Duty Gas Vehicles - Exhaust	0.7	4.1	8	0.6	68.5
153 - Evaporation	--	1.5	--	--	--
154 - Crankcase	--	--	--	--	--
155 - Tire/Brake Lining Wear	0.4	--	--	--	--
156 Heavy Duty Gas Vehicles - Exhaust	1.4	11.3	18	1.6	416
157 - Evaporation	--	1.7	--	--	--
158 - Crankcase	--	--	--	--	--
159 - Tire/Brake Lining Wear	0.5	--	--	--	--
160 Diesel Trucks - Exhaust	2.3	3.5	17.6	9.8	33.7
161 - Tire Wear	0.8	--	--	--	--
162 Buses - Exhaust	0.5	0.7	3.7	2.1	7.1
163 - Tire/Brake Lining Wear	0.2	--	--	--	--
164 Motorcycles (on-road) - 2 Stroke	0.1	0.8	--	--	2.6
165 - 4 Stroke	0.1	1.3	0.3	--	4.5
166 Motorcycles (off-road) - 2 Stroke	--	2	--	--	4.8
167 - 4 Stroke	--	1.1	--	--	2.5
123 Farm Tractors - Gasoline	--	0.4	0.5	--	11.3
124 - Diesel	0.2	0.3	1.6	0.1	0.6
MISC EMISSION SOURCES					
170 Accidental Wild Fires	0.7	0.8	0.1	--	4.9
171 Structural Fires	0.3	0.4	0.1	--	4.9
172 Roads - Paved	228	--	--	--	--
173 - Unpaved	6.6	--	--	--	--
80 Consumer Solvent Usage	--	45.3	--	--	--
175 Bio degradation	--	6.9	--	--	--
176 Ocean/Bay Salt	42.4	--	--	--	--
**177 Consumer Solvent Usage	--	**	--	--	--
GRAND TOTAL	536	515	543	182	2340

** Vegetation emissions are about 400 t/day as estimated by ABAG for the BAAQMD

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
District Emissions By Source Categories

2000 ANNUAL AVG.
BASE YEAR 1979
PRINTED: DEC 7, 1982

	PART	ROG	NOX	SO2	CO
	TONS/DAY				
PETROLEUM REFINING					
10 Refining Processes	1.7	0.1	8.2	38.5	0.3
11 Other Processes	0.1	4.6	--	--	--
12 Upsets, Leaks, Flaring	2.9	6	0.4	7.7	--
CHEMICAL MFG					
14 Nitric Acid	--	--	0.7	--	--
15 Phthalic Anhydride	--	--	--	--	--
16 Sulfur	0.1	0.1	--	27.8	15.1
17 Sulfuric Acid	0.3	0.1	--	27.8	--
18 Titanium Dioxide	--	--	--	--	22.9
19 Other Chemical Mfg	1.6	0.3	0.5	0.1	0.4
OTHER INDUSTRIAL/COMMERCIAL					
21 Photoresist	--	7	--	--	--
22 Pulp and Paper	1	0.2	0.5	--	6.6
23 Metallurgical	1.8	0.2	--	--	3.9
24 Asphaltic Concrete Plants	1.3	--	--	--	0.2
25 Concrete Batching	3.8	--	--	--	--
26 Glass and Related Products Mfg	2.3	--	--	1.7	--
27 Stone, Sand and Gravel	23.2	--	--	--	--
28 Sand Blasting	8.2	--	--	--	--
29 Cement Mfg	0.8	--	--	--	--
30 Salt	--	--	--	--	--
31 Food Preparation	10	--	--	--	--
32 Bakeries (Industrial)	--	2	--	--	--
33 Wineries, Breweries	--	0.4	--	--	--
34 Other Agricultural Processing	2.3	0.6	--	--	--
35 Farming Operations (Production)	21.2	--	--	--	--
36 Pesticides (Usage)	--	10.3	--	--	--
38 Construction Operations	123	--	--	--	--
39 Demolition Operations	0.7	--	--	--	--
40 Oil and Gas Field Operations	--	2.7	--	--	--
41 Wood Products Mfg	0.5	--	--	--	--
42 Land Farming	--	3.2	--	--	--
43 Gas Distribution	--	24.3	--	--	--
44 Other Industrial/Commercial	3.6	1.5	3.8	8.2	--
PETROLEUM REFINERY EVAPORATION					
47 Storage and Blending	--	14.6	--	--	--
48 Loading	--	3.8	--	--	--
FUELS DISTRIBUTION					
50 Bulk Plants - Storage Tanks	--	0.7	--	--	--
51 - Loading Trucks	--	2.3	--	--	--
52 Trucking	--	0.2	--	--	--
53 Filling Stations - Spillage	--	1.5	--	--	--
54 - Storage Tanks	--	4	--	--	--
55 - Filling Vehicle Tanks	--	4.3	--	--	--
OTHER ORGANIC COMPOUNDS EVAPORATION					
57 Storage Tanks - Solvent	--	1.1	--	--	--
58 - Other Organic Compounds	--	2.2	--	--	--
59 Structures Coating - High Solvent	--	--	--	--	--
60 - Low Solvent	--	26.9	--	--	--
61 Industrial Coating - High Solvent	--	17.2	--	--	--
62 - Low Solvent	--	29.2	--	--	--
63 Other Coating - High Solvent	--	22.5	--	--	--
64 - Low Solvent	--	0.3	--	--	--

	PART	ROG	NOX	SO2	CO
OTHER ORGANIC COMPOUNDS EVAP (Cont)					
65 Surface Coating Clean-up Solvent	--	8.3	--	--	--
66 Coatings Mfg	--	0.8	--	--	--
67 Asphalt Paving	--	4.3	--	--	--
68 Degreasers - Trichloroethane	--	--	--	--	--
69 - Trichloroethylene	--	0.7	--	--	--
70 - Other Solvents	--	11.7	--	--	--
71 Dry Cleaners - Perchloroethylene	--	7.9	--	--	--
72 - Other Solvents	--	1.5	--	--	--
73 Fiberglass Products Mfg	--	0.7	--	--	--
74 Rubber/Plastic Products Mfg	--	8.5	--	--	--
75 Printing - Rotogravure	--	2.5	--	--	--
76 - Flexographic	--	0.5	--	--	--
77 - Other Printing	--	3.5	--	--	--
78 Pharmaceuticals Mfg	--	0.5	--	--	--
79 Lightering, Marine Vessel Transfer	--	4.3	--	--	--
81 Other Organics Evaporation	--	11.9	--	--	--
COMBUSTION OF FUELS					
83 Domestic - Gas	3.9	0.9	25.5	0.2	5.1
84 - Liquid	--	--	--	0.2	--
85 - Solid	1.3	0.5	0.2	0.2	6.2
86 Commercial & Institutional - Gas	1.1	0.2	7.4	--	1.5
87 - Oil	--	--	0.1	0.1	--
88 Oil Refineries Ext Combust - NG	0.1	0.1	4.3	--	0.5
89 - Refinery Make Gas	1.9	0.7	38.6	3.8	2.8
90 - Fuel Oil	0.8	0.3	6.8	4.4	1.1
91 - Coke	--	--	0.2	0.6	--
92 Power Plants - NG fired Boilers	3.3	0.2	81.5	0.2	5.6
93 - Oil fired Boilers	4.4	0.4	42.7	36.4	2.8
94 - Coal fired Boilers	--	--	--	--	--
95 - Gas fired Turbines	--	--	--	--	--
96 - Oil fired Turbines	0.1	0.1	4	0.5	0.2
97 Asphaltic Concrete Plants - Gas	--	--	0.2	--	--
98 - Oil	--	0.1	0.7	0.3	--
99 Kilns - Gas	--	--	0.3	--	0.2
100 - Oil	--	--	0.1	0.5	--
101 - Coal	0.3	0.1	11.7	4.8	0.3
102 Turbines - Gas	0.3	0.2	9.9	0.1	2.2
103 - Oil	--	0.1	--	--	--
104 Reciprocating Engines - Lawnmowers	0.1	2.9	0.4	--	34.2
105 - Other Gasoline Engines	0.5	15.3	1.7	0.1	107
106 - Gas fueled	--	0.9	9.7	--	1.4
107 - Oil fueled	0.1	0.1	1.3	0.1	0.3
108 Orchard Heaters	--	--	--	--	--
109 Cogeneration	1	0.6	10.1	0.1	7.2
111 Other Combustion - NG	2.5	0.3	49.2	0.1	4
112 - Oil	0.2	0.1	1.6	1.5	0.1
113 - LPG	--	--	--	--	--
114 - Coke, Coal	--	--	0.2	0.9	0.5
115 - Other Fuels	0.1	--	1.3	1.6	0.1
BURNING OF WASTE MATERIAL					
117 Incineration - Residential	0.6	0.6	0.1	--	2.4
118 - Commercial/Institutional	0.4	0.1	0.9	0.3	0.1
119 - Industrial	0.1	--	--	--	0.1
120 Agricultural Debris Burning	0.3	0.3	--	--	1.8
121 Range/Forest Improvement Burning	--	--	--	--	0.2
122 Resource Recovery Projects	0.7	0.3	6.5	2.6	15

	PART	ROG	NOX	SO2	CO
OFF-HIGHWAY MOBILE SOURCES					
125 Construction Equipment - Gasoline	--	--	--	--	--
126 - Diesel	5.2	6	60.2	5.1	16.3
127 Steamships - Cargo & Passenger	0.3	0.1	2.4	11.4	--
128 - Tankers	0.1	--	0.6	2.5	--
129 - Military	--	--	--	0.2	--
130 Motorships (Fuel Oil) - Cargo	0.2	0.1	0.9	4.3	0.2
131 - Tankers	--	--	0.1	0.4	--
132 Motorships (Diesel) - Cargo & Tugs	0.2	1.3	1.8	0.4	0.6
133 - Tankers	--	0.1	0.2	--	0.1
134 Ferry Boats	--	--	0.1	--	--
135 Fishing Boats (Commercial)	0.1	0.5	0.9	0.1	0.4
136 Pleasure Boats - Diesel	0.1	0.3	0.7	0.1	0.3
137 - Gasoline (2-stroke)	--	7	1.4	0.1	34.6
138 - Gasoline (4-stroke)	--	7	1.4	0.1	34.6
139 Locomotives	0.4	1.7	5.4	0.8	1.9
TOTAL (DISTRICT JURISDICTION)	241	311	407	197	341
AIRCRAFT					
142 Air Carriers	5	3.8	11.9	1	18.3
143 General Aviation - Jet	8.8	2.3	2.6	0.6	9.7
144 - Piston	0.2	9.1	2.9	--	48.7
145 Military - Jet	0.5	1.8	1.3	0.3	4
146 - Piston	0.1	5.3	0.1	--	43.5
MOBILE SOURCES					
148 Cars & Light Duty Trucks - Exhaust	19.6	122	134	8.1	1250
149 - Evaporation	--	23.3	--	--	--
150 - Crankcase	--	--	--	--	--
151 - Tire/Brake Lining Wear	15.7	--	--	--	--
152 Medium Duty Gas Vehicles - Exhaust	1	3.7	7.3	1	44.4
153 - Evaporation	--	0.6	--	--	--
154 - Crankcase	--	--	--	--	--
155 - Tire/Brake Lining Wear	0.8	--	--	--	--
156 Heavy Duty Gas Vehicles - Exhaust	1.6	13.8	23.5	3	404
157 - Evaporation	--	0.9	--	--	--
158 - Crankcase	--	--	--	--	--
159 - Tire/Brake Lining Wear	1	--	--	--	--
160 Diesel Trucks - Exhaust	4.1	4.5	13.4	17.8	40.7
161 - Tire Wear	1.4	--	--	--	--
162 Buses - Exhaust	0.9	0.9	2.8	3.7	8.5
163 - Tire/Brake Lining Wear	0.3	--	--	--	--
164 Motorcycles (on-road) - 2 Stroke	0.1	0.5	--	--	1.5
165 - 4 Stroke	0.1	1	0.3	--	2.6
166 Motorcycles (off-road) - 2 Stroke	0.1	2.8	--	--	6.7
167 - 4 Stroke	--	1.5	--	--	3.5
123 Farm Tractors - Gasoline	--	0.3	0.4	--	10.1
124 - Diesel	0.2	0.2	1.4	0.1	0.6
MISC EMISSION SOURCES					
170 Accidental Wild Fires	0.7	0.8	0.1	--	4.9
171 Structural Fires	0.4	0.4	0.1	--	5.5
172 Roads - Paved	294	--	--	--	--
173 - Unpaved	8.6	--	--	--	--
80 Consumer Solvent Usage	--	50.6	--	--	--
175 Bio degradation	--	7.8	--	--	--
176 Ocean/Bay Salt	42.4	--	--	--	--
**177 Consumer Solvent Usage	--	**	--	--	--
GRAND TOTAL	649	569	610	233	2250

** Vegetation emissions are about 400 t/day as estimated by ABAG for the BAAQMD

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
District Emissions By Source Categories
1979 SEPTEMBER WK.DAY AVERAGE

BASE YEAR 1979
PRINTED:DEC 14, 1982

	TONS/DAY				
	PART	ROG	NOX	SO2	CO
PETROLEUM REFINING					
10 Refining Processes	1.3	0.1	6.4	29.9	0.2
11 Other Processes	0.1	5.9	--	--	--
12 Upsets,Leaks,Flaring	2.2	17.8	0.3	6	--
CHEMICAL MFG					
14 Nitric Acid	--	--	0.6	--	--
15 Phthalic Anhydride	--	--	--	--	--
16 Sulfur	0.1	0.1	--	22.8	12.5
17 Sulfuric Acid	0.1	--	--	18.5	--
18 Titanium Dioxide	--	0.2	--	--	18.8
19 Other Chemical Mfg	1.3	0.4	0.4	2.6	0.4
OTHER INDUSTRIAL/COMMERCIAL					
21 Photoresist	--	6.7	--	--	--
22 Pulp and Paper	1.6	0.2	0.5	--	5.5
23 Metallurgical	4.1	0.3	--	--	3.8
24 Asphaltic Concrete Plants	2.1	--	--	--	0.1
25 Concrete Batching	5.4	--	--	--	--
26 Glass and Related Products Mfg	1.9	--	--	1.3	--
27 Stone, Sand and Gravel	31.3	--	--	--	--
28 Sand Blasting	10.2	--	--	--	--
29 Cement Mfg	0.6	--	--	--	--
30 Salt	--	--	--	--	--
31 Food Preparation	7.2	--	--	--	--
32 Bakeries (Industrial)	--	2.5	--	--	--
33 Wineries, Breweries	--	2.3	--	--	--
34 Other Agricultural Processing	1.8	0.5	--	--	--
35 Farming Operations (Production)	39.8	--	--	--	--
36 Pesticides (Usage)	--	8.6	--	--	--
38 Construction Operations	199	--	--	--	--
39 Demolition Operations	1.1	--	--	--	--
40 Oil and Gas Field Operations	--	2.2	--	--	--
41 Wood Products Mfg	0.7	--	--	--	--
42 Land Farming	--	5	--	--	--
43 Gas Distribution	--	18	--	--	--
44 Other Industrial/Commercial	3.2	1.2	3.2	6.7	--
PETROLEUM REFINERY EVAPORATION					
47 Storage and Blending	--	12.2	--	--	--
48 Loading	--	3.4	--	--	--
FUELS DISTRIBUTION					
50 Bulk Plants - Storage Tanks	--	1.2	--	--	--
51 - Loading Trucks	--	3.6	--	--	--
52 Trucking	--	0.3	--	--	--
53 Filling Stations - Spillage	--	2.1	--	--	--
54 - Storage Tanks	--	6.3	--	--	--
55 - Filling Vehicle Tanks	--	6.2	--	--	--
OTHER ORGANIC COMPOUNDS EVAPORATION					
57 Storage Tanks - Solvent	--	1.6	--	--	--
58 - Other Organic Compounds	--	1.8	--	--	--
59 Structures Coating - High Solvent	--	25.7	--	--	--
60 - Low Solvent	--	15.7	--	--	--
61 Industrial Coating - High Solvent	--	90	--	--	--
62 - Low Solvent	--	1.6	--	--	--
63 Other Coating - High Solvent	--	25.9	--	--	--
64 - Low Solvent	--	--	--	--	--

	PART	ROG	NOX	SO2	CO
OTHER ORGANIC COMPOUNDS EVAP (Cont)					
65 Surface Coating Clean-up Solvent	--	15.9	--	--	--
66 Coatings Mfg	--	0.9	--	--	--
67 Asphalt Paving	--	8	--	--	--
68 Degreasers - Trichloroethane	--	--	--	--	--
69 - Trichloroethylene	--	0.7	--	--	--
70 - Other Solvents	--	11.1	--	--	--
71 Dry Cleaners - Perchloroethylene	--	12.8	--	--	--
72 - Other Solvents	--	4.3	--	--	--
73 Fiberglass Products Mfg	--	1.2	--	--	--
74 Rubber/Plastic Products Mfg	--	9.4	--	--	--
75 Printing - Rotogravure	--	7.7	--	--	--
76 - Flexographic	--	1.8	--	--	--
77 - Other Printing	--	4.5	--	--	--
78 Pharmaceuticals Mfg	--	0.9	--	--	--
79 Lightering, Marine Vessel Transfer	--	6.3	--	--	--
81 Other Organics Evaporation	--	15.5	--	--	0.1
COMBUSTION OF FUELS					
83 Domestic - Gas	1.5	0.4	10.1	0.1	2
84 - Liquid	--	--	0.1	0.4	--
85 - Solid	0.3	0.1	--	0.1	1.5
86 Commercial & Institutional - Gas	0.8	0.2	5.4	--	1.1
87 - Oil	--	--	0.1	0.1	--
88 Oil Refineries Ext Combust - NG	0.1	--	3.4	--	0.4
89 - Refinery Make Gas	1.5	0.5	29.6	3	2.2
90 - Fuel Oil	0.6	0.2	5	3.5	0.8
91 - Coke	--	--	0.1	0.3	--
92 Power Plants - NG fired Boilers	1.6	0.1	51.4	0.1	2.8
93 - Oil fired Boilers	6.2	0.6	53.9	50.6	3.9
94 - Coal fired Boilers	--	--	--	--	--
95 - Gas fired Turbines	--	--	--	--	--
96 - Oil fired Turbines	--	--	1.7	0.2	0.1
97 Asphaltic Concrete Plants - Gas	--	--	0.2	--	--
98 - Oil	--	0.1	0.4	0.2	--
99 Kilns - Gas	--	--	15.4	--	0.3
100 - Oil	--	--	0.6	1	0.1
101 - Coal	--	--	--	--	--
102 Turbines - Gas	0.2	0.2	6.9	--	1.5
103 - Oil	--	--	--	--	--
104 Reciprocating Engines - Lawnmowers	0.2	8.2	0.8	0.1	77.3
105 - Other Gasoline Engines	0.5	14.8	1.6	0.1	103
106 - Gas fueled	--	0.8	9.4	--	1.4
107 - Oil fueled	0.1	0.1	1.3	0.1	0.3
108 Orchard Heaters	--	--	--	--	--
109 Cogeneration	--	--	--	--	--
111 Other Combustion - NG	2	0.2	38.5	0.1	3.1
112 - Oil	0.1	0.1	1.2	1.1	0.1
113 - LPG	--	--	--	--	--
114 - Coke, Coal	--	--	0.1	0.7	0.4
115 - Other Fuels	0.2	--	1.6	2	0.1
BURNING OF WASTE MATERIAL					
117 Incineration - Residential	0.1	0.1	--	--	0.3
118 - Commercial/Institutional	0.9	0.1	0.9	0.3	0.1
119 - Industrial	0.1	--	--	--	0.2
120 Agricultural Debris Burning	0.4	0.5	--	--	1.8
121 Range/Forest Improvement Burning	--	--	--	--	--
122 Resource Recovery Projects	--	--	--	--	--

	PART	ROG	NOX	SO2	CO
OFF-HIGHWAY MOBILE SOURCES					
125 Construction Equipment - Gasoline	--	--	--	--	--
126 - Diesel	8.6	9.9	99.9	8.4	27.1
127 Steamships - Cargo & Passenger	0.3	—	1.9	9.2	—
128 - Tankers	0.1	—	0.5	2.1	—
129 - Military	—	--	--	0.2	—
130 Motorships (Fuel Oil) - Cargo	0.2	0.1	0.7	3.4	0.1
131 - Tankers	--	--	0.1	0.3	—
132 Motorships (Diesel) - Cargo & Tugs	0.1	1	1.4	0.3	0.5
133 - Tankers	--	0.1	0.2	—	0.1
134 Ferry Boats	--	--	0.1	—	--
135 Fishing Boats (Commercial)	--	0.1	0.3	—	0.1
136 Pleasure Boats - Diesel	--	0.2	0.4	—	0.2
137 - Gasoline (2-stroke)	--	4.3	0.9	0.1	21.2
138 - Gasoline (4-stroke)	--	4.3	0.9	0.1	21.2
139 Locomotives	0.4	1.6	5.2	0.7	1.8
TOTAL (DISTRICT JURISDICTION)	343	419	364	177	319
AIRCRAFT					
142 Air Carriers	4.1	5.8	7.3	0.8	16.5
143 General Aviation - Jet	1.5	0.4	0.4	0.1	1.6
144 - Piston	0.1	3.2	1	—	17
145 Military - Jet	0.4	1.2	0.9	0.2	2.8
146 - Piston	--	2.9	--	--	23.9
MOBILE SOURCES					
148 Cars & Light Duty Trucks - Exhaust	18.9	199	245	7.2	2570
149 - Evaporation	--	92.4	--	--	--
150 - Crankcase	--	2.6	--	--	--
151 - Tire/Brake Lining Wear	10.2	—	--	--	--
152 Medium Duty Gas Vehicles - Exhaust	1	9	16.5	0.5	115
153 - Evaporation	--	2.1	—	--	--
154 - Crankcase	--	0.4	—	--	--
155 - Tire/Brake Lining Wear	0.4	—	--	--	--
156 Heavy Duty Gas Vehicles - Exhaust	2	18.6	27	1.2	401
157 - Evaporation	--	2.3	—	--	--
158 - Crankcase	--	0.8	--	--	--
159 - Tire/Brake Lining Wear	0.5	--	--	--	--
160 Diesel Trucks - Exhaust	2.3	4	41.9	7.5	32.6
161 - Tire Wear	0.8	--	--	--	--
162 Buses - Exhaust	0.5	0.9	9.8	1.8	7.7
163 - Tire/Brake Lining Wear	0.2	—	--	--	--
164 Motorcycles (on-road) - 2 Stroke	0.1	2.5	--	--	5.7
165 - 4 Stroke	0.1	2.2	0.2	—	9.6
166 Motorcycles (off-road) - 2 Stroke	--	1.2	—	--	2.8
167 - 4 Stroke	--	0.6	--	--	1.4
123 Farm Tractors - Gasoline	0.1	0.9	1	—	21.6
124 - Diesel	0.5	0.7	3.3	0.3	1.2
MISC EMISSION SOURCES					
170 Accidental Wild Fires	2.1	2.4	0.2	—	15
171 Structural Fires	0.2	0.2	0.1	—	2.7
172 Roads - Paved	248	--	--	--	--
173 - Unpaved	5.5	--	--	--	--
80 Consumer Solvent Usage	--	40.9	--	--	--
175 Bio degradation	--	6.4	—	--	--
176 Ocean/Bay Salt	42.4	—	--	--	--
**177 Consumer Solvent Usage	--	**	--	--	--
GRAND TOTAL	685	823	718	197	3570

** Vegetation emissions are about 400 t/day as estimated by ABAG for the BAAQMD

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
District Emissions By Source Categories

1987 SEPTEMBER WK.DAY AVERAGE

BASE YEAR 1979
PRINTED:DEC 14, 1982

	TONS/DAY				
	PART	ROG	NOX	SO2	CO
PETROLEUM REFINING					
10 Refining Processes	1.4	0.1	7	32.9	0.3
11 Other Processes	0.1	4.1	--	--	--
12 Upsets,Leaks,Flaring	2.5	5.1	0.3	6.6	--
CHEMICAL MFG					
14 Nitric Acid	--	--	0.6	--	--
15 Phthalic Anhydride	--	--	--	--	--
16 Sulfur	0.1	--	--	24.8	13.5
17 Sulfuric Acid	0.2	0.1	--	20.1	--
18 Titanium Dioxide	--	--	--	--	20.4
19 Other Chemical Mfg	1.5	0.3	0.4	0.1	0.4
OTHER INDUSTRIAL/COMMERCIAL					
21 Photoresist	--	7.6	--	--	--
22 Pulp and Paper	0.9	0.2	0.5	--	5.9
23 Metallurgical	1.8	0.2	--	--	4.1
24 Asphaltic Concrete Plants	1.2	--	--	--	0.1
25 Concrete Batching	5.8	--	--	--	--
26 Glass and Related Products Mfg	2	--	--	1.5	--
27 Stone, Sand and Gravel	34	--	--	--	--
28 Sand Blasting	11.1	--	--	--	--
29 Cement Mfg	0.7	--	--	--	--
30 Salt	--	--	--	--	--
31 Food Preparation	7.8	--	--	--	--
32 Bakeries (Industrial)	--	2.7	--	--	--
33 Wineries, Breweries	--	2.4	--	--	--
34 Other Agricultural Processing	1.9	0.5	--	--	--
35 Farming Operations (Production)	39.2	--	--	--	--
36 Pesticides (Usage)	--	9.3	--	--	--
38 Construction Operations	228	--	--	--	--
39 Demolition Operations	1.3	--	--	--	--
40 Oil and Gas Field Operations	--	2.4	--	--	--
41 Wood Products Mfg	0.7	--	--	--	--
42 Land Farming	--	5.5	--	--	--
43 Gas Distribution	--	19.6	--	--	--
44 Other Industrial/Commercial	3.4	1.3	3.4	7.3	--
PETROLEUM REFINERY EVAPORATION					
47 Storage and Blending	--	12.5	--	--	--
48 Loading	--	3.7	--	--	--
FUELS DISTRIBUTION					
50 Bulk Plants - Storage Tanks	--	0.9	--	--	--
51 - Loading Trucks	--	2.9	--	--	--
52 Trucking	--	0.3	--	--	--
53 Filling Stations - Spillage	--	1.8	--	--	--
54 - Storage Tanks	--	5.4	--	--	--
55 - Filling Vehicle Tanks	--	5.3	--	--	--
OTHER ORGANIC COMPOUNDS EVAPORATION					
57 Storage Tanks - Solvent	--	1	--	--	--
58 - Other Organic Compounds	--	2	--	--	--
59 Structures Coating - High Solvent	--	--	--	--	--
60 - Low Solvent	--	26.3	--	--	--
61 Industrial Coating - High Solvent	--	18.7	--	--	--
62 - Low Solvent	--	29.1	--	--	--
63 Other Coating - High Solvent	--	27.3	--	--	--
64 - Low Solvent	--	--	--	--	--

	PART	ROG	NOX	SO2	CO
OTHER ORGANIC COMPOUNDS EVAP (Cont)					
65 Surface Coating Clean-up Solvent	--	8.1	--	--	--
66 Coatings Mfg	--	1	--	--	--
67 Asphalt Paving	--	5.8	--	--	--
68 Degreasers - Trichloroethane	--	--	--	--	--
69 - Trichloroethylene	--	0.7	--	--	--
70 - Other Solvents	--	11.1	--	--	--
71 Dry Cleaners - Perchloroethylene	--	6.5	--	--	--
72 - Other Solvents	--	1.4	--	--	--
73 Fiberglass Products Mfg	--	0.8	--	--	--
74 Rubber/Plastic Products Mfg	--	9.3	--	--	--
75 Printing - Rotogravure	--	2.6	--	--	--
76 - Flexographic	--	0.5	--	--	--
77 - Other Printing	--	4	--	--	--
78 Pharmaceuticals Mfg	--	0.4	--	--	--
79 Lightering, Marine Vessel Transfer	--	5.8	--	--	--
81 Other Organics Evaporation	--	11.5	--	--	0.1
COMBUSTION OF FUELS					
83 Domestic - Gas	1.7	0.4	11	0.1	2.2
84 - Liquid	--	--	--	0.1	--
85 - Solid	0.4	0.2	--	0.1	2
86 Commercial & Institutional - Gas	0.8	0.2	5.9	--	1.1
87 - Oil	--	--	0.1	0.1	--
88 Oil Refineries Ext Combust - NG	0.1	--	3.7	--	0.4
89 - Refinery Make Gas	1.7	0.6	32.6	3.3	2.4
90 - Fuel Oil	0.7	0.2	5.5	3.9	0.9
91 - Coke	--	--	0.1	0.4	--
92 Power Plants - NG fired Boilers	2.8	0.1	88.3	0.2	4.8
93 - Oil fired Boilers	2.3	0.2	19.9	18.6	1.4
94 - Coal fired Boilers	--	--	--	--	--
95 - Gas fired Turbines	--	--	--	--	--
96 - Oil fired Turbines	--	--	2	0.3	0.1
97 Asphaltic Concrete Plants - Gas	--	--	0.2	--	--
98 - Oil	--	0.1	0.4	0.2	--
99 Kilns - Gas	--	--	0.3	--	0.1
100 - Oil	--	--	0.1	0.4	--
101 - Coal	--	--	--	--	--
102 Turbines - Gas	0.2	0.2	7.6	--	1.7
103 - Oil	--	--	--	--	--
104 Reciprocating Engines - Lawnmowers	0.1	6.1	0.8	0.1	68.3
105 - Other Gasoline Engines	0.5	17.2	1.9	0.1	120
106 - Gas fueled	--	0.9	9.7	--	1.4
107 - Oil fueled	0.1	0.1	1.4	0.1	0.3
108 Orchard Heaters	--	--	--	--	--
109 Cogeneration	--	--	--	--	--
111 Other Combustion - NG	2.2	0.2	42.1	0.1	3.4
112 - Oil	0.1	0.1	1.3	1.2	0.1
113 - LPG	--	--	--	--	--
114 - Coke, Coal	--	--	0.1	0.7	0.4
115 - Other Fuels	0.2	--	1.7	2.1	0.1
BURNING OF WASTE MATERIAL					
117 Incineration - Residential	0.1	0.1	--	--	0.4
118 - Commercial/Institutional	0.5	0.1	1	0.3	0.1
119 - Industrial	0.2	--	--	--	0.2
120 Agricultural Debris Burning	0.4	0.5	--	--	1.8
121 Range/Forest Improvement Burning	--	--	--	--	--
122 Resource Recovery Projects	--	--	--	--	--

	PART	ROG	NOX	SO2	CO
OFF-HIGHWAY MOBILE SOURCES					
125 Construction Equipment - Gasoline	--	--	--	--	--
126 - Diesel	9.6	11	111	9.4	30.3
127 Steamships - Cargo & Passenger	0.3	--	2.1	10.1	--
128 - Tankers	0.1	--	0.5	2.3	--
129 - Military	--	--	--	0.2	--
130 Motorships (Fuel Oil) - Cargo	0.2	0.1	0.7	3.7	0.1
131 - Tankers	--	--	0.1	0.3	--
132 Motorships (Diesel) - Cargo & Tugs	0.1	1.1	1.5	0.3	0.5
133 - Tankers	--	0.1	0.2	--	0.1
134 Ferry Boats	--	--	0.1	--	--
135 Fishing Boats (Commercial)	--	0.1	0.3	--	0.1
136 Pleasure Boats - Diesel	--	0.2	0.5	--	0.2
137 - Gasoline (2-stroke)	--	4.7	1	0.1	23.1
138 - Gasoline (4-stroke)	--	4.7	1	0.1	23.1
139 Locomotives	0.4	1.8	5.6	0.8	2
TOTAL (DISTRICT JURISDICTION)	372	319	375	153	338
AIRCRAFT					
142 Air Carriers	4.6	5	9.8	0.9	17.9
143 General Aviation - Jet	2.3	0.6	0.7	0.1	2.5
144 - Piston	0.1	3.5	1.1	--	18.8
145 Military - Jet	0.4	1.5	1.1	0.2	3.5
146 - Piston	0.1	4.4	--	--	35.8
MOBILE SOURCES					
148 Cars & Light Duty Trucks - Exhaust	14.5	113	151	6.4	1530
149 - Evaporation	--	44.8	--	--	--
150 - Crankcase	--	--	--	--	--
151 - Tire/Brake Lining Wear	11.1	--	--	--	--
152 Medium Duty Gas Vehicles - Exhaust	0.7	4.5	8.7	0.6	75
153 - Evaporation	--	1.6	--	--	--
154 - Crankcase	--	--	--	--	--
155 - Tire/Brake Lining Wear	0.5	--	--	--	--
156 Heavy Duty Gas Vehicles - Exhaust	1.5	12.4	19.7	1.8	456
157 - Evaporation	--	1.8	--	--	--
158 - Crankcase	--	--	--	--	--
159 - Tire/Brake Lining Wear	0.6	--	--	--	--
160 Diesel Trucks - Exhaust	2.5	3.9	19.2	10.8	36.9
161 - Tire Wear	0.8	--	--	--	--
162 Buses - Exhaust	0.6	0.9	4.5	2.5	8.7
163 - Tire/Brake Lining Wear	0.2	--	--	--	--
164 Motorcycles (on-road) - 2 Stroke	0.1	0.8	--	--	2.7
165 - 4 Stroke	0.1	1.3	0.3	--	4.5
166 Motorcycles (off-road) - 2 Stroke	--	1.7	--	--	3.9
167 - 4 Stroke	--	0.9	--	--	2
123 Farm Tractors - Gasoline	--	0.7	0.9	--	20.7
124 - Diesel	0.4	0.5	3	0.3	1.1
MISC EMISSION SOURCES					
170 Accidental Wild Fires	2.1	2.4	0.2	--	15.1
171 Structural Fires	0.2	0.2	0.1	--	3
172 Roads - Paved	305	--	--	--	--
173 - Unpaved	6.8	--	--	--	--
80 Consumer Solvent Usage	--	44.4	--	--	--
175 Bio degradation	--	6.9	--	--	--
176 Ocean/Bay Salt	42.4	--	--	--	--
**177 Consumer Solvent Usage	--	**	--	--	--
GRAND TOTAL	769	577	595	177	2580

** Vegetation emissions are about 400 t/day as estimated by ABAG for the BAAQMD

APPENDIX F

AMENDMENT TO THE ENVIRONMENTAL IMPACT REPORT ON THE SAN FRANCISCO BAY AREA ENVIRONMENTAL MANAGEMENT PLAN

ASSOCIATION OF BAY AREA GOVERNMENTS

EXECUTIVE BOARD
RESOLUTION NO. 4-82

CERTIFICATION OF ENVIRONMENTAL IMPACT REPORT
FOR 1982 BAY AREA AIR QUALITY PLAN

WHEREAS, the General Assembly by Resolution No. 1-79 adopted the 1979 Bay Area Air Quality Plan in January 1979; and

WHEREAS, the 1979 Bay Area Air Quality Plan is Chapter VI of the Environmental Management Plan; and

WHEREAS, pursuant to the Federal Clean Air Act amendments are necessary to conform the plan to the 1982 requirements; and

WHEREAS, the 1982 Bay Area Air Quality Plan was prepared and released for public review in July 1982; and

WHEREAS, the proposed plan contains in Appendix F proposed amendments to the Environmental Impact Report for the Environmental Management Plan; and

WHEREAS, the proposed plan was circulated for public review and comment at duly noticed public hearings; and

WHEREAS, the Board of Directors of the Bay Area Air Quality Management District has adopted the stationary source control measures, after modification to respond to public comment; and

WHEREAS, the Metropolitan Transportation Commission has adopted transportation control measures, after modification to respond to public comment; and

WHEREAS, as a result of these actions, the EIR text changes recommended in the draft plan have been made to conform to the actions taken by the District and MTC; and

WHEREAS, the Executive Board proposes to adopt the 1982 Bay Area Air Quality Plan as an amendment to the Environmental Management Plan and the State Implementation Plan provisions applying to the Bay Area;

NOW THEREFORE BE IT

RESOLVED, that Appendix F of the 1982 Bay Area Air Quality Plan be certified as an amendment to the EIR for the Environmental Management Plan in accordance with the requirements of the California Environmental Quality Act; and be it further

RESOLVED, that ABAG affirms and commits to work with the District and MTC in carrying out other portions of the plan; and be it further

RESOLVED, that the Air Resources Board is requested to act on the 1982 Bay Area Air Quality Plan expeditiously, and to forward such plan as a revision and supplement to the existing State Implementation Plan provisions for the Bay Area.

The foregoing resolution was passed by the Executive Board this 2nd day of December, 1982.

Attest:

Revan A. F. Tranter

Revan A. F. Tranter
Secretary-Treasurer

Signed:

Ralph C. Bolin

Ralph C. Bolin
President

AMENDMENT TO THE ENVIRONMENTAL IMPACT REPORT ON THE SAN FRANCISCO BAY AREA ENVIRONMENTAL MANAGEMENT PLAN

INTRODUCTION

This report is an amendment to the previous EIR for the Air Quality Plan as contained in Volume II of the Environmental Management Plan, June 1978. Amendments for 1982 are required under the 1977 Clean Air Act because the 1979 plan did not demonstrate attainment of the applicable air quality standards for ozone and carbon monoxide by 1982. EPA granted the Bay Area an extension of the attainment deadline to 1987, as permitted by the Act.

The report presents general narrative descriptions of the proposed control strategies and their impacts, followed by tables which present the information in more complete form.

DESCRIPTION OF THE PROPOSED PROJECT

Two general control strategies are proposed to improve air quality and meet the federal standards for ozone and carbon monoxide:

- o an ozone control strategy to meet the federal one-hour ozone standard by 1987; and
- o a carbon monoxide strategy to meet the federal eight-hour standard by 1987.

Both general strategies consist of a series of primary and contingency control measures which are listed in Table F-3 (see also appendices A,B,C and D), and which are discussed in general below.

Ozone Control Strategy - A reduction of 85 tons/day of hydrocarbons is required by 1987 in order to attain the federal ozone standard. To that end, a series of control measures, constituting revisions of or additions to the original hydrocarbon controls, have been recommended. The control measures are of four main types:

1. Motor vehicle inspection and maintenance (I/M) - an annual program to ensure that motor vehicles in the light-duty auto, light-and medium-duty truck classes have operating emissions controls and that they conform to prescribed standards.

2. Stationary source control measures - there are 22 such control measures proposed, including, for example, tanker ballasting (requiring segregated ballast or a washed ballast tank and an inert gas system for tankers larger than 40,000 DWT), modification of reciprocating engines (requiring replacement of two-cycle engines with four-cycle, and four-cycle engines with electric motors where possible), and pesticide controls (banning the use of weed oil and requiring the use of water or other non-VOC carriers and limiting overspray), to name a few;

3. Transportation control measures - primarily reaffirm committments to the original transportation controls, such as supporting ridesharing, increasing mass transit ridership, and developing high occupancy vehicle (HOV) lanes;

4. Administrative programs - including, for example, advisory review of projects and plans wherein, using the existing CEQA environmental document process, the three co-lead air quality planning agencies would issue advisory comments on specific projects and would work with developers to minimize adverse air quality impacts of projects.

Carbon Monoxide Control Strategy: Unlike the regional scope of the ozone problem and its corrective measures, the objective of this localized strategy is to attain the federal eight-hour standard for carbon monoxide in three cities: San Jose, Oakland and Vallejo. Special monitoring programs have identified these cities as having exceeded the standards and, as such, they are targeted for control measures specific to the nature and extent of their CO problems. For example, in San Jose, where the CO problem is most severe, three primary measures are recommended--two of these are the aforementioned I/M and advisory review measures and the other (which is also a recommended control measure for ozone) is conformity assessment of federally supported activities (formalizing the existing federal grant application review function to specifically include conformity with the 1982 Bay Area Air Quality Plan). In Oakland, in addition to advisory review and conformity assessment, a comprehensive transportation plan and air quality analysis is recommended to assess the impact of the rapidly expanding central business district on the city's air quality. In Vallejo the trend toward lower vehicle emissions as a result of the existing California vehicle emissions program is sufficient to attain the CO standard by 1987, therefore, no additional controls are recommended.

Additional Measures Recommended by the Joint Air Quality Planning and Advisory Committee for Consideration in the Plan

1. Mandatory Indirect Source Review - this measure would require review of development projects, such as shopping centers, which generate or attract traffic. The goal would be to introduce mitigation measures which reduce

traffic congestion and minimize air quality impacts. This mandatory review process would replace the advisory review process for indirect sources above specified size criteria.

2. Land Use Controls - this strategy consists of 16 specific policies and 49 actions which would alter regionwide development patterns to reduce automobile travel by means of local and regional policies on land use and urban services.

3. Public Support for Transit - these measures are reiterated in the transportation control measures descriptions.

4. Additional CARB measures - transportation measures identified by the California Air Resources Board may provide additional strategies for local implementation.

SIGNIFICANT ENVIRONMENTAL EFFECTS OF THE PROPOSED PROJECT

Before enumerating the possible effects of the carbon monoxide and ozone amendments, it should be noted that the Regional Plan into which they fit is an integrated document to be read and applied as a whole. Specific objectives, policies and actions are to be undertaken in coordination with the balance of the plan. Taken as a whole, with the proposed amendments, the plan will not have significantly adverse environmental effects as defined by CEQA. A summary of the effects, which are also discussed briefly in the following sections, appears in Table F-3.

The overall positive effects attributable to these amendments, as they were for the control measures in the Environmental Management Plan, are summarized in Section VI and below:

- o improvement in air quality through reduction of emissions of hydrocarbons and carbon monoxide
- o improvements in public health
- o reduction in damage to vegetation
- o reduction in damage to man-made materials
- o improvements in scenic, amenities and recreational amenities

Assessments of possible adverse effects from these additional, more stringent control measures considered their impact on the following subject areas: 1. environmental resources - air quality, surface/groundwater resources, physical resources and energy resources; 2. institutional/financial resources; 3. economic resources - production of goods/services, consumer expenditures, income and investment; and 4. social welfare - housing supply, physical mobility, sense of community and equity. While each of these are discussed individually and summarized in Table F-3, an overview of the impact assessments are summarized below in Table F-1. Many of the impacts of the proposed strategies addressed in this report were discussed in both

the previous EIR for the air quality plan (see the Bay Area Environmental Management Plan, Volume II, June 1978) and in the draft Air Quality Maintenance Plan (September 1977) which preceeded it.

TABLE F-1. IDENTIFICATION OF POTENTIALLY SIGNIFICANT ADVERSE ENVIRONMENTAL EFFECTS

EFFECTS	CONTROL STRATEGY	
	Ozone	Carbon Monoxide
Environmental		
Air Quality	None	None
Surface/Groundwater	Potent. Signif.	None
Physical Resources	Potent. Signif.	None
Energy	Potent. Signif.	None
Institutional/Financial	None	Potent. Signif.
Economic		
Production of Goods, Services	Potent. Signif.	None
Consumer Expenditures	Potent. Signif.	Potent. Signif.
Income and Investment	Potent. Signif.	Not Signif.
Social		
Housing Supply	Potent. Signif.	None
Physical Mobility	None	None
Health and Safety	None	None
Sense of Community	Potent. Signif.	None
Equity	Potent. Signif.	Potent. Signif.

ENVIRONMENTAL EFFECTS

1. Air quality

The carbon monoxide and ozone control strategies would lead to attainment of the federal standards by 1987 and would, therefore, significantly improve air quality. The specific positive effects of improved air quality were mentioned previously, and will be discussed in the following subsections.

2. Surface/Groundwater

There would be no significant adverse effects on water quality or supply from the proposed amendments. Increased demand for both wastewater treatment capacity and water supply are accomodated by existing regional policies which have been subjected to extensive environmental analysis pursuant to CEQA. While localized surface runoff

problems could occur from implementation of policies presuming increased construction (e.g., HOV lanes), these would be minimized by local governments' existing surface runoff control programs and by policies of ABAG's water quality management plan. Beyond these, mitigation measures to control runoff problems would have to be addressed specifically by project developers as part of the CEQA plan approval process. Therefore, no significant adverse surface runoff effects will occur as a result of implementation of the proposed amendments.

The proposed land use measures would provide greater preservation of outlying area watersheds, estuarine systems and groundwater recharge areas. In addition, land use measures would lower per capita consumption rates of municipal and domestic water supplies due to increased development densities (e.g. smaller lawns, etc.).

3. Physical Resources

While no adverse effects would result from CO control strategies, there is a potentially significant effect from some of the ozone strategies. On the positive side, approximately 10,000 to 12,000 gallons/day of volatile organic compounds could be conserved. On the other hand, those measures requiring installation of new or modified equipment could consume a considerable amount of construction materials and other physical resources.

Land use measures would impact physical resources by reducing conversion of agricultural land to urban uses; by reducing damage to vegetation and animal life due to lower pollutant concentrations; by reducing conversion of mineral, timber, quarry and geothermal areas to urban uses; by increasing development pressure on land uniformly suited for special development purposes (e.g., airports, parks); and by less conversion of undeveloped land to urban uses which would increase regionwide preservation of critical environmental areas (e.g., prime agricultural areas, ecological habitats such as marshes, steep slopes and flood-prone areas, etc.).

Decreased hydrocarbon emissions would reduce the damage to vegetation that results from exposure to photochemical oxidants. Trees, shrubs and many agricultural crops in the Bay Area are affected by the ozone levels which occur. Adverse effects range from visible injury and discoloration of foliage, leaf drop, reduced plant vigor and growth, to total plant loss. Certain crops (snapdragons, chrysanthemums) are no longer grown here and others (graps, carnations, orchids) evidence serious damage. Grapes and ornamental plants are specialty crops grown in few other parts of the country and, as such, they are an important component of the region's economy. To realize their productive value, certain specialty crops must be grown in locations proximate to urban areas, yet many Bay Area ornamental growers have been forced to move to Half Moon Bay and Salinas to avoid air pollution damage. Improved air quality would ensure the viability of these crops and this important sector of the Bay Area economy.

4. Energy

It is possible that certain stationary source ozone control measures will adversely affect energy consumption. For particular industries these energy impacts may be significant - for example, requirements of best available control technology and, in some cases, lowest achievable emission rate may result in a net energy penalty for those industries affected. The total energy penalty from stationary source controls is difficult to estimate at this time, but it appears that the range energy penalty (expressed in terms of cost) might be from $1 million to $3 million per year. Table F-2, below, summarizes the relevant proposed controls and the source of their potential energy penalties.

TABLE F-2. STATIONARY SOURCE CONTROLS WITH LIKELY ENERGY PENALTIES

Control Measure	Source of Energy Penalty
Electronics Industry	Use of carbon adsorption or catalytic oxidation
Aerospace Assembly & Component Coatings Operations	Reformulation of water-based paints
Aerosol Cans	Use of inert gas or pump & stick
Coating of Plastics	Reformulation of paints to water-based or high solids
Landfill Sites	Use of gas well and header systems to collect VOC, then ducted to incinerator
Auto Refinishing	Installation of totally enclosed paint spray booths equipped with paint arresters, water curtains and/or electrical incineration and adsorption
Bakeries	Installation of direct flame or catalytic afterburners

As a mitigating factor it should be noted that existing ABAG policies in housing and transportation call for reduction in wasteful or inefficient energy consumption practices. The Regional Plan's energy policies also recommend the Bay Area Air Quality Management District adopt regulations promoting energy efficiency, recognizing that there will be energy-consumptive effects from stationary source regulations.

Transportation controls would offer the same general energy impacts as indicated in the previous EIR; gasoline savings specific to the proposed measures have been estimated to be approximately 18-19 million gallons per year from carpooling, mass transit and bicycle use, offset by minor increases in transit fuel consumption.

The land use control measures would lower per unit household energy consumption and provide overall reductions in transportation fuel consumption beyond those already cited.

Institutional/Financial Effects

1. Institutional

The governmental and other administrative structures for implementing these control measures already exist in the Bay Area - for example, the Bay Area Air Quality Management District actively enforces air pollution control programs in the Bay Area and Caltrans handles the RIDES carpool program; since the measures being proposed here are merely more stringent extensions of measures already in force, additional structures are generally unnecessary. In the case of the recommended I/M program, as was cited in the previous EIR, specific institutional arrangements for its implementation will have to be developed, since this activity is not within the current authority of any State or local agency. The CARB and/or the Bureau of Automotive Repair (BAR) would likely assume responsibility for the regulation and operation of I/M programs. Local government agencies' involvement is not anticipated. I/M programs can be directly administered by the State or franchised out to private contractors; due to the disproportionate demands on State administrative resources demonstrated by the South Coast Air Basin, a private-operated/public-monitored program may be preferable for the Bay Area.

The proposed land use measures would have a potentially significant institutional impact in that they require significant changes in planning and zoning administration-related activity (e.g., amendment of regional and local general plans, zoning ordinances and subdivision regulation revisions, etc.). Also, greater coordination would be needed among local agencies whose decisions affect development, and increased governmental coordination and technical support would be required in order to facilitate local action.

2. Financial

Increased costs to the Bay Area Air Quality Management District may be 6% of the District's budget, or $600,000/year. Other local government costs are minimal, except for landfill sites which are unknown at this time.

Economic Effects

1. Production of Goods/Services

Increased technological dependence by the Bay Area industrial sector to improve regional air quality will require substantial capital investment. In some instances, these added restrictions and costs will adversely affect the competitive position of local industries inter-regionally where the cost of these investments may be passed on to the consumer. Measures for ozone control that pertain to coatings, waste disposal and consumer solvents will require that process changes occur in order to reduce levels of air pollution. Changed product composition resulting from different processes may cause reduced durability and increased liability potentials. Phased implementation of this program may help minimize these problems. In addition, special consideration may be needed for the food processing industry in meeting health standards.

The implementation of I/M measures would add a new line of service for the California automotive service industry. Although some services for identifying defective emission control equipment on cars presently exist, they are not universally applicable to all California registered vehicles. I/M programs for light-, medium- and heavy-duty vehicles would offer a universally applied service program for identification and repair of vehicles with excessive emissions caused by maladjusted or defective emission control equipment.

Transportation control measures would provide new employment in the transit sector, with the possibility of adverse effects on parking lot operators.

Land use measures, in addition to supporting the benefits of transportation controls, would increase job opportunities and commercial activities in urban areas, meaning less commercial growth in outlying areas.

2. Consumer Expenditures

Direct costs of implementing the stationary source control measures will initially fall upon industry, but will eventually be paid for by the consumer and local taxpayer. This type of expenditure will not increase productivity, but will cause inflationary activity. Higher prices for Bay Area products may cause non-Bay Area consumers to look elsewhere for the same product. In either case, the proposed controls will ultimately result in increased cost of consumer goods. In addition to the aforementioned indirect consumer costs, control measures such as I/M programs may result in direct cost increases to consumers, as they must replace faulty or noncompliant emission control devices. The average cost of the I/M inspection is $15 per vehicle, and the average cost of repairs for the failed vehicle is approximately $30.

Transportation controls will continue to result in both increased costs to those operating private autos, and savings to those commuters utilizing carpools, vanpools or transit.

Land use controls could increase housing prices and rents for a short time due to any production lags that might occur as builders adjust to zoning and subdivision regulations changes. There may also be increases in urban area property taxes in order to support services to new developments, and due to increased land values. Reductions in residential waste collection charges and residential and commercial energy charges would also be expected. Land use controls could shift housing demand outside the Bay Area and affect consumer housing preference in other ways as well. Finally, such controls could mean more disposable income due to lower transportation costs.

3. Income and Investment

The costs for implementing the recommended control strategies are summarized in Table F-3.

Land use control measures would have the effect of lowering regionwide demand for investment due to reduced public capital requirements. Such measures would also shift the emphasis of public and private financial investment for renovation and replacement from outlying to urban areas. Residential land prices could increase in urban centers and decline in outlying areas. Housing rehabilitation and maintenance industries as well as higher density residential production would be stimulated. The housing industry's profit/cost structure may also be affected. Industrial land prices would not be significantly impacted due to the large industrial land supply within urban areas.

Social Welfare Effects

1. Housing Supply

The potential impact on housing supply comes from the proposed land use measures which, if implemented, could: increase conversions of older urban area single-family structures; lower the proportion of substandard units regionwide due to rehabilitation/redevelopment efforts; cause a temporary lag in new urban residential construction as builders adjust to zoning and subdivision regulation changes; reduce new residential construction in outlying areas within the region; and increase new construction and rehabilitation activity throughout urban areas, particularly older development areas.

2. Physical Mobility

Neither general strategy would involve additional impacts on physical mobility beyond those identified in the previous EIR which would result from the transportation and land use control measures. These impacts include: additional transit service and carpool/vanpool availability increasing commuters' options for mobility; increased pedestrian activity as urban services are brought within closer

proximity; decreased regionwide total vehicle miles traveled; shorter trips by automobile, resulting in travel time savings; a possible increase in local traffic congestion as local streets are used more; and greater inconvenience for private automobile users (e.g., parking difficult to find).

3. Health and Safety

Except for carbon monoxide "hot spots", the only air quality standard not met in the Bay Area is the 0.12 ppm ozone standard - since the implementation of these recommended control strategies would reduce hydrocarbon emissions and, therefore, ozone impact, there will be on improvement in public health as was identified in the previous EIR. The benefits noted there (e.g., decreased mucous membrane irritation, respiratory distress, health impairment of high risk populations, etc.) would continue and be expanded as standards are gradually met. Improvements in safety, as noted in the previous EIR (e.g., decreased traffic accidents from transportation controls, elimination of hazards associated with the use and storage of combustible solvents from stationary source controls), would also continue and be improved as the recommendations in these amendments are implemented. On the negative side, the only adverse affects could result from land use controls which could produce increased pedestrian safety problems on local streets, and possibly greater exposure to localized CO pollutant concentrations, depending on the success of technological controls and the amount of increase in use of transit.

4. Sense of Community

There are no adverse effects on the sense of community, with the possible exception of land use measures which could result in higher density development. On the other hand, the very same land use measures could also enhance neighborhood identities, due to the diversity and density of activities, and could increase time for non-work activity (i.e., time perhaps spent in the community) due to shorter commutes.

5. Equity

A major question of equity involves the competitive position of Bay Area industries that are placed under the proposed stationary source restrictions and controls. Employment opportunities created in local industries producing air pollution control equipment will not offset increased unemployment resulting from the competitive disadvantage (see "Production of Goods/Services"). The willingness of EPA and CARB to require similar measures outside of the Bay Area is of obvious concern to the region.

In addition, the I/M program will adversely impact some groups in urban areas more severely than others, particularly those with limited incomes. Older vehicles generally need more extensive repairs--costing as much as $150 or more. This may place a special financial burden on lower-income persons, who are more likely to own older vehicles. The possible consequences of an I/M program might be: a) an increased incidence of motorists driving without valid registration; b) greater

use of public transportation; and c) reduced mobility for low-income persons who have no access to public transportation.

With regard to transportation controls, the previous EIR identified equity issues which are still applicable--the additional transit services will particularly benefit low income, handicapped and other persons who depend on mass transit, and pricing disincentives will influence commuters (primarily middle income) who choose to continue driving their cars.

Finally, the equity issues related to land use measures as identified in the previous EIR (e.g. expanded transit and broadened housing opportunities on the positive side and, on the negative side, displacement of poor, aged, minority, and handicapped residents of areas undergoing rehabilitation and redevelopment, and budget impacts of those on low and fixed incomes due to cost of living increases in renewed areas) would still be applicable and of concern.

ALTERNATIVES TO THE PROPOSED ACTION

The No Action Alternative to the 1982 Bay Area Air Quality Plan

The major alternative to the 1982 Bay Area Air Quality Plan in its entirety is one of no action. The Clean Air Act Amendments of 1977 requires each State to prepare State Implementation plans identifying how ambient air quality standards will be met, and set forth specific requirements for those plans, which the 1982 Bay Area Air Quality Plan attempts to satisfy. No action would mean that the Bay Area's air quality would not meet health-based national standards, and that the Bay Area would not comply with the requirements of federal law, therefore becoming subject to continuation of specific sanctions (penalties) identified in the Clean Air Act and enforced by EPA. These sanctions include a ban on construction of new or modified major sources of air pollution, and withholding of federal funds for specific highway and sewage treatment projects and air pollution control grants.

Contingency Measures

In addition to the primary control measures designed to meet the goals of the two general strategies, there are contingency measures for each which will be implemented if it appears likely that the federal standards for ozone and/or carbon monoxide will not be attained using the primary controls alone. The contingency measures have been summarized in Appendices A and B to the Plan.

Measures Not Reasonably Available

In the process of generating and analyzing options for air pollution control measures which would lead to attainment of the federal standards, there were several which, for various reasons, were deemed not to be reasonably available and were therefore, eliminated from further consideration. These options are presented, along with the rationale for their elimination, in Appendix D to the Plan.

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The proposed amendments would have significant benefits for the maintenance and enhancement of long-term productivity, in keeping with those of the air quality plan as a whole. In reviewing the potential impacts of each strategy on the primary subject areas of concern (e.g., environment, economy, society, etc.) it is clear that the control measures involved will provide positive impacts which will serve to balance out the potential short-term negative impacts.

Of particular significance, and fundamental to the rationale for air quality improvements, are the benefits to be enjoyed as the public health and welfare are improved.

The health and welfare problems which have been linked to air pollution carry enormous potential for decreasing the long-term productivity of the people, plants and animals in the environment. Therefore, these additional control measures, in conjunction with those already in existence, will move the Bay Area towards attainment of the standards which have been deemed necessary in order to protect the health of people and the environment.

ANY SIGNIFICANT IRREVERSIBLE ENVIRONMENTAL CHANGES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED

The policies of the proposed amendments, like those of the 1979 Plan, should not result in irreversible changes to the environment. Implementation of these actions would generally reduce or eliminate the significant irreversible environmental changes that would result if air quality is not improved (e.g., deterioration of physical resources, such as vegetation, and public health). Federal air quality standards seek, in part, to protect and enhance environmental quality.

THE GROWTH INDUCING IMPACTS OF THE PROPOSED ACTIONS

The 1982 Bay Area Air Quality Plan should not have growth inducing effects.

TABLE F-3. SUMMARY OF PROPOSED CONTROL MEASURES AND THEIR IMPACTS

SUMMARY OF PROPOSED CONTROL MEASURES AND THEIR IMPACTS

RECOMMENDATIONS	DIRECT BENEFITS (EMISSION REDUCTIONS, TONS/DAY) 1987	IMPLEMENTING AGENCY(S)	SCHEDULE FOR ACTION A-ADOPTION I-FULLY IMPLEMENTED	TOTAL COST/YEAR OF RECOMMENDED ACTION	FINANCING MECHANISM	LEGAL AUTHORITY
I. MOTOR VEHICLE INSPECTION AND MAINTENANCE						
Implement annual inspection/maintenance program to ensure that motor vehicles in the light-duty auto, light- and medium-duty truck classes have operating emissions controls and that they conform to prescribed emissions standards.	Carbon monoxide: 367 Hydrocarbons: 29	California Department of Consumer Affairs	A-1984 I-1987	$31,500,000	-State General Fund -I/M Program Revenues	New legislation required.

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
Air Quality o See "Direct Benefits" column. Water Quality o No impact. Physical Resources o Reducing emissions of air pollutants will have a beneficial impact on vegetation and other man-made materials which are currently being damaged by such pollutants. These beneficial effects will result from this strategy as well as the others being proposed in this plan. Energy Resources o No impact.	Institutional o Specific institutional arrangements will have to be developed, since I/M is not within the current authority of any State or local agency. The California Department of Consumer Affairs would likely assume responsibility for the regulation and operation of these programs. Local government agencies' involvement is not anticipated. o I/M programs can be directly administered by the State or franchised out to private contractors, due to the disproportionate demands on State administrative resources demonstrated by the South Coast Air Basin, a private-operated/public-monitored program may be preferable for the Bay Area. Financial Direct Public Cost of Implementation o See column headed "Total Cost/Year of Recommended Action". Fiscal Effect on Local Government o No impact.	Production of Goods and Services o Implementation of I/M measures would add a new line of service for the California automotive service industry. Some services presently exist for identifying defective emission control equipment, but they are not universally applicable to all California registered vehicles. I/M programs for light-, medium-, and heavy-duty vehicles would offer a universally applied service program for identification and repair of vehicles with excessive emissions caused by maladjusted or defective emission control equipment. Consumer Expenditures o I/M consumer costs are comprised of the inspection fee and related maintenance and repair costs which may be incurred. The inspection fee will probably not exceed $15, and the average cost of repairs for the failed vehicle is approximately $30. Income and Investment o See private costs in the column headed "Total Costs/Year of Recommended Action." o Improved maintenance may prolong vehicle life.	Housing Supply o No impact Physical Mobility o Because of the increased cost of private transportation, the mobility of the limited income segment of the Bay Area population may be reduced, particularly for those in other than urban areas. Health and Safety o The substantial reduction in emissions of carbon monoxide and hydrocarbons from this measure could produce substantial health-related benefits, particularly for high risk groups and those who experience the heaviest exposures while residing, working or shopping in urban centers. Sense of Community o No impact. Equity o Older vehicles generally need more extensive repairs, this may place a special financial burden on lower-income persons who are more likely to own older vehicles.

RECOMMENDATIONS	DIRECT BENEFITS (EMISSION REDUCTIONS, TONS/DAY) 1987	IMPLEMENTING AGENCY(S)	SCHEDULE FOR ACTION A-ADOPTION I-FULLY IMPLEMENTED	TOTAL COST/YEAR OF RECOMMENDED ACTION	FINANCING MECHANISM	LEGAL AUTHORITY
II. STATIONARY SOURCE CONTROLS						
1. Tanker Ballasting: Use segregated ballast or washed ballast tank and inert gas system for tankers larger than 40,000 DWT	2.5	U.S. Coast Guard	A, I-1981	No direct costs	Administrative/Regulatory -ad valorem tax revenues -ARB subvention funds -Federal Clean Air Act funds -permit fees Operating/Maintenance -private Capital -private -California Pollution Control financing authority -Federal Small Business Administration loan programs	The Bay Area Air Quality Management District (BAAQMD) was created by the California Legislature in 1955. The District structure, operating procedures and authority are contained in Division 26 of the California Health and Safety Code.
2. Reciprocating Engines: Replace 2-cycle engines with 4-cycle; replace 4-cycle engines with electric motors where possible	4.0	Bay Area Air Quality Management District (BAAQMD)	A-1984 I-1985	$290,000		
3. Gasoline Distribution: Lower exemption cutoffs to require Phase I, II controls at additional service stations	1.0	BAAQMD	A-1985 I-1985	$180,000		
4 Pesticides: Ban weed oil; use water or other non-VOC carriers; limit overspray	3.7	BAAQMD	A-1984 I-1984	$530,000		
5 Wood Furniture Coating: Use low solvent coatings and high transfer efficiency spray methods	1.1	BAAQMD	A-1985 I-1986	$200,000		
6. Organic Chemical Manufacturing: Requires control of VOC fugitive emissions from pumps, compressors, process vessel depressurization and process relief valves	0.3	BAAQMD	A-1986 I-1986	$58,000		
7. Aerospace Assembly & Component Coating Operations: reformulate paints by converting to waterbased or high-solids paints or substituting non-reactive solvents for reactive ones in conventional paints	0.5	BAAQMD	A-1982 I-1983	$180,000		
8. Consumer Solvents: Reduce VOC content/reactivity after product-by-product review.	4.0	BAAQMD	A-[illegible] I-[illegible]	$6[illegible]		
9. Coating of Plastics: Use low-solvent coatings or equivalent control by condensation, adsorption, [illegible]	2.0	BAAQMD	A-[illegible] I-198[illegible]	$[illegible],000		
10. Semiconductor/PC Manufacturing: Use condensation, adsorption, etc. to control solvent emissions	5.7	BAAQMD	A-1983 I-198[illegible]	$[illegible]		
11. Industrial Maintenance Coatings: Use low-solvent coatings for some industrial maintenance applications	1.0	BAAQMD	A-198[illegible] I-198[illegible]	$370,000		

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
<u>Air Quality</u> o See "Direct Benefits" column. <u>Water Quality</u> o No impacts. <u>Physical Resources</u> o Conservation of 10,000 to 12,000 gals/day of volatile organic compounds. (Approx. $4 million per year.) o Some rules (best available control technology) would consume construction materials, water, disposal facilities, etc. <u>Energy Resources</u> o Use of BACT (5 or 6 measures) and, in some cases, lowest attainable emission rate (1 or 2) may result in a net energy penalty. <u>Public Facilities</u> o No serious impact other than landfill sites which may use land owned by either public or private parties.	<u>Institutional</u> o The governmental structure for implementing these control measures already exists in the Bay Area Air Quality Management District (BAAQMD) which actively enforces air pollution control programs in the Bay Area. The proposed amendments are an expansion of existing organic emission rules to cover new categories of sources, or are more stringent extensions of measures already in force for control of industrial and stationary sources of air pollution. <u>Financial</u> Direct Public Costs of Implementation o See "1982 Costs of Recommended Control Actions" column, annualized costs of $24 million to $62 million per year. Fiscal Effects on Local Government o Increased costs to BAAQMD may be 6% of District's budget, or $600,000/year. Other local governmental costs are minimal except for landfill sites, which are not clear at this time. The governmental structure for the implementation of these control measures already exists in the Bay Area Air Quality Management District, as mentioned above.	<u>Production of Foods and Services</u> o Increased technological dependence by the Bay Area industrial sector to improve regional air quality will require substantial capital investment. In some instances, these added restrictions and costs will adversely affect the competitive position of local industries interregionally where the cost of these investments may be passed on to the consumers. o Measures pertaining to coatings, waste disposal and consumer solvents will require that process changes occur in order to reduce levels of air pollution. Changed product composition resulting from different processes may cause reduced durability and increased liability potentials. Phased implementation of this program may help minimize these problems. o Special consideration may be needed for the food processing industry in meeting health standards. <u>Consumer Expenditures</u> o Direct costs of implementing these measures will initially fall upon industry but eventually be paid by the consumer and local taxpayer. This type of expenditure will not increase productivity but cause inflationary activity. Also, higher prices for Bay Area products may cause non-Bay Area consumers to look elsewhere for the same product. In either case, the proposed controls will result in increased cost of consumer goods. <u>Income and Investments</u> o See column "1982 Costs of Recommended Control Action"	<u>Housing Supply</u> o No impacts. <u>Physical Mobility</u> o No impact. <u>Health and Safety</u> o Air quality standards for each of the pollutants are based upon scientifically derived air quality criteria. Air quality criteria are an expression of current information concerning the relationship between various concentrations of pollutants in the air and their adverse effects on man and his environment. The control measures being proposed are designed to meet the standards, i.e., to reduce the concentration of various pollutants in the air. Pollutant concentration reductions from the air will reduce potentially adverse effects from these substances, thereby favorably impacting public health. o With regard to safety, the stationary source control program may eliminate many hazards associated with the use and storage of combustible solvents <u>Sense of Community</u> o No impact. <u>Equity</u> o A major question of equity involves the competitive position of Bay Area industries that are placed under the restrictions and controls proposed. Employment opportunities created in local industries producing air pollution control equipment will not offset increased unemployment resulting from the competitive disadvantage (see "Production of Goods and Services"). The willingness of EPA and CARB to require similar measures outside of the Bay Area is of obvious concern to the region.

RECOMMENDATIONS	DIRECT BENEFITS (EMISSION REDUCTIONS, TONS/DAY) 1987	IMPLEMENTING AGENCY(S)	SCHEDULE FOR ACTION A-ADOPTION I-FULLY IMPLEMENTED	TOTAL COST/YEAR OF RECOMMENDED ACTION	FINANCING MECHANISM	LEGAL AUTHORITY
II. STATIONARY SOURCE CONTROLS (Cont'd.)						
12. VOC Storage: Lower control requirement cut-offs from 1.5 psia and 40,000 gallons to 0.5 psia and/or 10,000 gallons	3.0	BAAQMD	A-1985 I-1985	$990,000		
13. Large Commercial Bakeries: Control oven VOC emissions from large commercial bakeries	1.1	BAAQMD	A-1986 I-1986	$400,000		
14. Zero Gap Seals on Floating Roof Tanks: Install "zero gap" seals on most floating roof tanks	1.5	BAAQMD	A-1985 I-1986	$22,000		
15. Polymer & Resins Manufacturing: Use condensation, adsorption to control VOC emissions from reactor vessels, etc.	0.2	BAAQMD	A-1986 I-1987	$120,000		
16. Rubber /Plastic Products Manufacturing: Use condensation, adsorption or incineration to control VOC emissions from molding, curling, cementing, etc.	1.1	BAAQMD	A- 1986 I-1986	$640,000		
17. Coatings Manufacturing: Requires control of VOC emissions from reactors, blenders, mixers, and transfer and storage	0.2	BAAQMD	A-1986 I-1987	$150,000		
18. Natural Gas & Crude Oil Production: Requires control of VOC emissions from valves, flanges, pumps, compressors, relief valves and storage tanks	1.6	BAAQMD	A-1986 I-1986	$440,000		
19. Sanitary Landfill Sites: Install gas collection systems to be combusted directly or separated into a saleable methane portion and non-methane portion to be incinerated	7.2	BAAQMD	A,I-1984	$9,500,000		
20. Vegetable Oil Manufacturing: Use mineral oil scrubber and proper maintenance/operation per draft EPA CTG for extractors, desolventizers, dryers, coolers and conveyers	0.4	BAAQMD	A-1986 I-1987	$150,000		
21. Volatile Organic Waste Disposal: Strip and recover VOC from wastes prior to disposal	6.0	BAAQMD	A-1984 I-1985	$5,200,000		
22. Automobile Refinishing:	5.2	BAAQMD	A-1984 I-1985	$5,400,000		
23. Letterpress/Offset Printing:	3.0	BAAQMD	A-1985 I-1985	$2,000,000		

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
	See preceding page.		

RECOMMENDATIONS	DIRECT BENEFITS (EMISSION REDUCTIONS, TONS/DAY) 1987	IMPLEMENTING AGENCY(S)	SCHEDULE FOR ACTION A-ADOPTION I-FULLY IMPLEMENTED	TOTAL COST/YEAR OF RECOMMENDED ACTION	FINANCING MECHANISM	LEGAL AUTHORITY
III. TRANSPORTATION CONTROLS						
1. Reaffirm commitment to 28% transit ridership increase between 1978 and 1983.	Included in 1979 Air Quality Plan - no additional credits are claimed.	Metropolitan Transportation Commission (MTC), transit districts.	Measure is currently being implemented, with a 26% increase in ridership resulting in the first 3-year period.	Included in Transportation Improvement Program - no additional costs.	-Federal Mass Transportation Assistance Program -Fare Revenues -Local Transportation Development Act Funds -State Mass Transportation Assistance Programs -Toll Bridge Revenues	-Local Transit District Enabling Legislation -MTC Enabling Legislation
2. Support post-1983 improvements identified in public transit operators' 5-year plans; after consultation with the operators, adopt ridership increase target for 1983-1987.	Hydrocarbons: 0.72 Carbon Monoxide: 7.15 Nitrogen Oxides: 1.04		A-1982 I-continuing	Costs of maintaining existing level of services is currently programmed in regional allocations. Ridership increases would come from productivity improvements, thus additional costs would be moderate.		
3. Seek to expand and improve public transit beyond committed levels.	Hydrocarbons: 0.37 Carbon Monoxide: 3.69 Nitrogen Oxides: 0.54		MTC seeks new sources of revenue on an ongoing basis; if funding exists, transit operators implement plans to expand services.	Transit operators have submitted capital requests for FY83-87, of these, $119.4 million cannot be funded with currently anticipated revenues. Additional funds would also be needed for operating subsidies. However, this measure has other benefits so the costs cannot be solely attributed to air quality.		
4. Continue to support development of high-occupancy-vehicle (HOV) lanes.	Depends on specific project. Emission credits would not be allowed for specific projects until environmental studies were completed and funds were programmed.	Caltrans, cities and counties	A-1979 I-varies with the project	Varies by specific project; since these projects have other benefits, the costs cannot be solely attributed to air quality.	-Federal Aid Highway Programs -State Highway Program Funds	-Caltrans enabling legislation -Local planning and traffic control enabling legislation
5. Continue to support RIDES efforts, carpool matching and vanpooling.	Emissions credits already included in 1979 Plan - no additional credit is claimed.	RIDES, MTC, Caltrans	A-1979 I-continuing	Funds are already programmed; no additional costs are associated with this measure.	-Federal Aid Highway Programs -State ride-sharing funds	-Caltrans enabling legislation -RIDES charter -MTC enabling legislation
6. Continue efforts to obtain funding to support long range transit improvements (including a light rail line in the Guadalupe Corridor and various BART extensions).	It is likely that none of the projects included in this measure can be implemented prior to 1987, hence no emissions credits are claimed.	MTC, transit districts	A-1979 I-continuing	Project design costs over the next 5 years total $35 million, construction costs of the Guadalupe project over the next 5 years is $18[illegible] million[1]	Same as #1	Same as #1
7. Reaffirm commitment to preferential parking program: opening more fringe parking lots and free vanpool parking areas.	Emissions credits already included in 1979 Plan - no additional credit is claimed.	Caltrans	A-1979 I-continuing	Costs already included in the Transportation Improvement Program, no additional costs are associated with this measure.	Same as #5.	-Caltrans enabling legislation

1. Due to the range of benefits from these measures the costs cannot be attributed solely to air quality.

ENVIRONMENTAL IMPACTS

Air Quality

- See "Direct Benefits" column.

Water Quality

- No impact.

Physical Resources

- No impact other than the reduction in damage to vegetation and man-made materials associated with lower pollutant emissions.

Energy

- Gasoline savings estimated to be 18-19 million gallons/year from carpooling, the shift to transit, improved traffic flow, and the shift to bicycles..
- Minor increase in transit fuel consumption.

Amenities

- Cleaner air.
- Improved pedestrian environment in auto-control zone.

INSTITUTIONAL/FINANCIAL IMPACTS

Institutional

- Organizational and governmental structures necessary to implement these measures are already in existence and, as these are continuations of previously adopted measures, progress in their implementation is already ongoing.

Financial

- Certain measures, notably the additional transit services, bus/carpool lanes, and bicycle systems, are rather costly. There is some funding available, but additional funds will be needed.
- Other measures would generate revenue which could be used to finance the incentives mentioned above.

ECONOMIC IMPACTS

Production of Goods and Services

- New employment in the transit sector.
- Possible adverse effect on parking lot operators.

Consumer Expenditures

- Increase in cost of operating private autos.
- Savings to those commuters utilizing carpools, vanpools or transit.

SOCIAL IMPACTS

Housing Supply

- No impact.

Physical Mobility

- Additional transit service would increase mobility of all transit users.
- Carpool/vanpool measures would increase travel options for most commuters.
- Some restriction on private auto access in the auto control zone.

Health and Safety

- Reduction in auto accidents with improved peak period flow.
- Exercise benefits for those who bicycle.
- Possible increase in number, but not rate, of bicycle accidents with increased usage.

Sense of Community

- No impact.

Urban Patterns

- The combination of incentives like additional transit service and disincentives on private auto use will encourage a more compact land use pattern, with employees living closer to transit lines and or their jobs.
- Pricing disincentives will impact primarily middle income commuters who choose to continue driving their cars.

RECOMMENDATIONS	DIRECT BENEFITS (EMISSION REDUCTIONS, TONS/DAY) 1987	IMPLEMENTING AGENCY(S)	SCHEDULE FOR ACTION A-ADOPTION I-FULLY IMPLEMENTED	TOTAL COST/YEAR OF RECOMMENDED ACTION	FINANCING MECHANISM	LEGAL AUTHORITY
III. TRANSPORTATION CONTROLS (Cont'd.)						
8. Encourage transit operators to work with Caltrans to identify underutilized lots along major transit lines which could be used as park-and-ride lots.	Hydrocarbons - 0.4 Carbon Monoxide - 0.19 Nitrogen Oxides - 0.05	Caltrans, transit districts	A-1979 I-continuing	Equivalent annual cost of this measure is $22,850.[1]	-State Highway Program funds	Same as #7.
9. Expand present Commute Alternatives Program: informing employers of transportation alternatives and training commute coordinators within a firm to promote the goals of the program.	Hydrocarbons - 0.87 Carbon Monoxide - 0.83 Nitrogen Oxides - 0.89	MTC	A-1979 I-continuing train 30 commute coordinators each year	Equivalent annual cost is $35,420.	-Federal Mass Transit Assistance Programs -Local Transportation Development Act funds -State Ridesharing funds	-MTC enabling legislation
10. Develop information program on traffic and air quality mitigation measures for local government.	Hydrocarbons - 0.69 Carbon Monoxide - 6.04 Nitrogen Oxides - 0.27	MTC, cities and counties	A-1979 I-continuing	Equivalent annual cost is $13,700[1]	-Local Transportation Development Act funds -City General Funds	-Municipal zoning enabling legislation
11. Support the expansion of the Gasoline Conservation Awareness (GasCAP) Program currently operating through West Valley Community College--several additional regional GasCAP training centers are needed for the Bay Area.	Depends upon the number of centers funded, the number of client agencies per center and the fuel use of each client agency--reductions in fuel use of 10 46% have been demonstrated by previous client agencies.	Regional operation concept as follows: -State Energy Commission and CA Energy Extension Service - provide overall coordination of statewide plan, of which the Bay Area is a part. -CalTrans - sponsoring agency which receives federal monies and transfers them to statewide coordinating agencies. -GasCAP-(West Valley Com. College) provids assistance and training to regional center agencies offering program. -Regional Center Agency - provides regional GasCAP service.	A-1982 I-additional training centers can be operational within 1 year of funding.		-Grant funds are being sought for additional regional centers -Participant fees provide ongoing support.	-None required.
12 Commute Transportation Program	Reduces background CO level 14% from 1987 baseline case.	Santa Clara County Transit District	Measure is currently being implemented.	$400,000	-Federal Aid Urban Program funds, State Ridesharing funds, Local Transportation Development Act funds, Urban Mass Transportation Agency Funds.	-Local transit district enabling legialation.

1. Due to the range of benefits from these measures the costs cannot be attributed solely to air quality.

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS

See preceding page.

RECOMMENDATIONS	DIRECT BENEFITS (EMISSION REDUCTIONS, TONS/DAY) 1987	IMPLEMENTING AGENCY(S)	SCHEDULE FOR ACTION A-ADOPTION I-FULLY IMPLEMENTED	TOTAL COST/YEAR OF RECOMMENDED ACTION	FINANCING MECHANISM	LEGAL AUTHORITY
IV. ADMINISTRATIVE PROGRAMS						
1. Advisory Review of Projects and Plans: This program is directed toward new or modified facilities, both public and private, and plans that could result in significant impacts on air quality. The three co-lead air quality planning agencies would review plans and proposals and issue comments related to minimizing their adverse air quality impacts as early in the planning stages as possible. The existing California Environmental Quality Act environmental document process would be used as the primary vehicle for receiving information and communicating advisory comments.	Unknown	Association of Bay Area Governments, Metropolitan Transportation Commission, Bay Area Air Quality Management District	A, I-1982	Unknown	-co-lead air quality planning agencies, existing budgets	-Under CEQA any interested parties may participate in the review-and-comment process -This process, being strictly advisory, would not require further legal authority
2. Conformity Assessment of Federally-Supported Activities: As the area-wide clearinghouse for all Federal grant applications, ABAG's Executive Board comments on Federal grant applications for conformity with regional policies, including provisions of the air and water quality management plans. Hence, assessment of conformity with the provisions of Sections 176(c) and 316 of the Clean Air Act would be formally incorporated into this process. Section 176(c) mandates that agency activities be in conformity with approved plans, and Section 316 outlines the consequences of failure to do so.	Unknown	Association of Bay Area Governments	A, I-1982	Unknown	-existing budgets	-Authority for grant application clearinghouse responsibilities comes from the Federal Intergovernmental Cooperation Act and the Federal Demonstration Cities and Metropolitan Development Act
3. Comprehensive Transportation Plan and Air Quality Analysis of Oakland Central Business District (CBD) Development: Downtown Oakland is currently projected to experience significant growth in the Central Business District which may have adverse impacts on traffic circulation and local air quality. Even with an Inspection/Maintenance Program, the Federal 8-hour CO standard may ultimately be exceeded. Therefore, a study of the collective impacts of this growth on traffic circulation and transit use, which will result in the development of mitigation strategies, is recommended as an action that the City of Oakland should undertake.	Unknown - Carbon monoxide levels are of concern	City of Oakland, ABAG, BAAQMD, and MTC	A-1982 I-1983	Unknown	-City of Oakland to fund the transportation assessment portion with ABAG, BAAQMD, and MTC assisting in preparation of the air quality assessment	-None needed

ENVIRONMENTAL IMPACTS	INSTITUTIONAL/FINANCIAL IMPACTS	ECONOMIC IMPACTS	SOCIAL IMPACTS
The environmental impacts of these programs is difficult to assess at this time in other than general terms. As the programs involve prevention of adverse effects on environmental quality (including air, water, energy, physical resources, etc.) through studies, advisory review and conformity assessment, it is anticipated that substantial environmental benefits could result. These benefits are heightened by the fact that the programs result in a comprehensive analysis of both the individual and collective impacts of regional activities with environmental consequences, rather than fragmented analyses and recommendations from several different agency review processes. Thus, the reviewee benefits by advice and assessments, and the reviewers benefit by focusing on major environmental problems together.	<u>Institutional</u> o Both of the first two administrative programs utilize institutional structures and policies that are already in existance, and into which these proposed activities fit easily o Where necessary, special relationships would be established with local jurisdictions having air pollution control problems which require individual attention, such as the Oakland CO problem targeted by the third proposal. <u>Financial</u> o As the first two proposed administrative activities are merely more formalized versions of activities that are currently being done by the agencies indicated, there would be no impact on their financial resources. o The impact study of the Oakland CBD would require city funds, which would likely be diverted from other potential uses.	As with the environmental impacts, the economic and social impacts of these programs is difficult to assess at the outset. The existence of coordinated, comprehensive regional plans whose purpose is to minimize adverse and maximize positive effects on economic, social and environmental resources provides a framework within which these two administrative programs will function. Consequently, the review process and comments utilized on these programs will reflect these adopted regional policies and will result in minimal negative and maximal positive impacts on the various resources of concern.	

APPENDIX G

DIRECT AND INDIRECT EMISSIONS ASSOCIATED WITH MAJOR FEDERAL ACTIONS, 1982-1987

DIRECT AND INDIRECT EMISSIONS ASSOCIATED WITH MAJOR FEDERAL ACTIONS, 1982-1987

Introduction

This section is prepared in accordance with EPA's requirement that "in preparing the 1982 SIP revision, states and local governments should identify, to the extent possible, the direct and indirect emissions associated with major federal actions, including wastewater treatment facility grants, that will take place during the period covered by the SIP. Explicit identification of emissions will enable state and local governments to more quickly and easily evaluate subsequent federal conformity determinations." (Federal Register, Vol. 46, No. 14, pp. 7182-7194.)

Methodology

Compliance with the aforementioned requirement was complicated by the lack of criteria for identifying what is meant by both the terms "major" and "federal action." This necessitated the use of subjective judgment; OCS lease sale activity appears to be the only obvious major federal action identifiable at this time. Beyond that, the following is a list of activities which could merit consideration, should future clarification of "major federal actions" be found to encompass them.

Direct

1. Federal Buildings
    a. post office
    b. military hospitals
    c. military airport creation/expansion
    d. military base expansions, closures, realignments, etc.

Indirect

1. Permit Issuance
    a. coal handling facility
2. Grants
    a. synfuels
    b. wastewater treatment/disposal
    c. water supply facilities
    d. coastal planning
3. Other
    a. oil/gas lease sales
    b. surplus land disposition

While it is presently not possible to identify in advance all relevant federal actions which will occur between now and 1987, reliance will be placed on the continuing implementation of the "Conformity Assessment of Federally-Supported Activities" process, which is presented as a recommended air quality maintenance strategy in this report, to develop a set of working criteria for determining what constitutes a "major federal action". The relevant conformity issues will be addressed within that framework.

OCS Lease Sale

The following summarizes the major findings on air quality impacts of a Five-Year Oil and Gas Leasing Schedule as presented in Volume 1 of the Final Supplement to the Final Environmental Statement prepared by the U.S. Department of the Interior, Bureau of Land Management. These impacts apply to the San Francisco Bay and North Central Coast Air Basins; it is not possible at this time to report impacts for the San Francisco Bay Air Basin alone.

- Nineteen platforms are expected to be installed over the 38 million acres of the planning area. Cumulative onshore impacts due to the aggregate emissions from all these platforms are possible, but are unlikely to be serious if they occur at all. Each of the 19 platforms likely will affect the onshore coastal area for 5-10 years during exploration, platform installation, and development drilling and for about 30 years during the production phase. The installation of the 19 platforms will occur over a 10-year period.

- Of the 19 proposed platforms associated with the development of the resources, approximately 15 are expected to be located in this near-shore offshore area, and will require emission controls. No new onshore refineries or gas processing plants are required under this alternative.

- Any emission sources which would adversely affect the onshore air quality would be subject to mitigation required by EPA and the State, if located onshore, or by DOI, if located on the OCS. Required controls would conform with Best Available Control Technology (BACT), and emission offsets, if needed.

- If a blowout, oil spill, or fire were to occur at a platform near shore, short-term violations of several NAAQS could occur onshore, depending on the type and duration of the accident.

- A possible significant cumulative air quality impact may result from the increased level of transporting the produced products from the platforms to shore by barge. This impact could be minimized by the use of pipelines as the transport method. Another possible significant cumulative impact may result from the clustering of many platforms. This situation along with the barging of produced products to shore may result in very high localized cumulative impacts. This impact could be minimized by the piping of oil from the production platforms to shore, the application of the DOI air quality rules which have a provision to address the cumulative impact of many OCS facilities and the fact that clustering will probably not occur.

- Conclusions. The level of expected impacts to air quality in the region is low. No new major onshore sources associated with the proposal are forecast.

Estimated representative emissions per platform for development/production operations are provided in Table 1.* It is estimated that 90 exploratory wells will be drilled to identify the resources and 465 development/production wells and 19 platforms to develop the resources under this alternative. It was assumed, for the purposes of analysis, that production from an average platform would be 0.9 million barrels of oil and 1.2 billion cubic feet of gas per year. Three-quarters of the oil produced in the region is assumed to be transportated by tanker or barge, while 1/4 will be transported through subsea pipelines.

TABLE 1. ESTIMATED REPRESENTATIVE EMISSIONS (PER PLATFORM)

Activity	Pollutant Emissions (tons per year) VOC	NO_x	TSP	SO_2	CO	Notes/Source
Platform installation	16	465	22	31	75	ERG (1981) - assumes platform installation occurs over 9 months, includes all support activities
Development drilling	9	240	11	21	71	ERG (1981) - assumes 2 wells drilled at a time and 12 wells drilled per year, includes all support activities
Oil/gas production	3.8	100	3	5	26	ERG (1981) - assumes average production of .9 million barrels of oil and 1.2 billion cubic feet of gas per year - all activities including on platform operations and all support activities
Barging	29	5.8	0.2	0.4	0.8	ERG (1981) - all phases of barging including loading and unloading and transit to and from platform (platform is assumed to be 20 miles from shore and half of the oil produced is barged to shore)

* Total aggregate emissions loading appears high (if one multiplies the figures in Table 1 by 19 for each phase of operation). This total from the planning area can be calculated but is not a useful measure of the onshore air quality impacts. These impacts at a particular location are the critical factors and are dependent on the location of platforms, the phase of operation and its level of activity and the number of platforms that can potentially affect the onshore air quality at that location. In reality, onshore impacts will be spread along the entire coastline in relationship to the location and distance from shore of the platforms.

APPENDIX H

TRANSPORTATION CONFORMITY ASSESSMENT

PROCEDURES AND CONTINGENCY PLAN

Conformity Assessment

Section 176(c) of the Clean Air Act includes a provision that:

> No metropolitan planning organization designated under section 134 of title 23, United States Code, shall give its approval to any project, program, or plan which does not conform to a plan approved or promulgated under Section 110

MTC is the MPO for the Bay Area. The above requirement will be satisfied in the following manner.

- o The Regional Transportation Plan will be assessed yearly at the time it is being amended (September) to determine if it complies with the Air Quality Plan. This assessment will include: 1) an evaluation of the continued support of the TCMs, and 2) a determination of the air quality impacts of the RTP amendments. The Commission will make a formal determination of conformity after this assessment.
- o The Transportation Improvement Program (TIP) will be reviewed each year to determine its compliance with the Air Quality Plan. All transportation projects with Federal funding must be in the TIP. The review will include: 1) an assessment of the implementation of the adopted TCMs in the TIP, and 2) an assessment of major highway projects to determine if they will adversely affect emissions. This review will be included as a chapter of the TIP.
- o Individual project applications currently undergo an environmental assessment by MTC. This will also serve to ensure conformity.

Contingency Plan

EPA guidlines require a contingency plan for transporation measures which will be implemented if reasonable further progress is not achieved. This contingency plan contains three elements:

a) List of transportation projects with potentially adverse air quality impacts which will be delayed while the air quality plan is being revised.

MTC believes that providing a list of specific projects in this plan is impractical for two reasons:

- o the project list would change depending on the year that the RFP target is not met

- the environmental documentation on projects in the later years of the Transportation Improvement Program (TIP) is not yet available in most cases.

Accordingly, if the RFP target is not met, MTC may delay certain categories of projects in the TIP if they are shown to have significant adverse impact on air quality. The criteria for delaying projects and specific projects to be delayed will be determined following the initial public hearing under section b. The categories which may be delayed include:

- Freeway Congestion Relief Projects (HB 42)*
- Freeway Traffic Service Projects (HB 43)
- Conventional Highway and Expressway Operational Improvement Projects (HB 44)
- New Connections and Cross-Traffic Improvements (HE 11)
- Upgraded Facilities (HE 12)
- Lane Additions (HE 13)
- New Highways (HE 14)
- Projects funded by the Federal Aid Urban Program which increase roadway capacity.

b) <u>Process for determining/implementing additional TCMs</u>

In July of each year, an RFP report will be submitted to EPA. Part of this report will be a review of the status of implementation of the adopted TCMs. A second portion would assess the growth in vehicle travel in the region. If a determination is made that RFP is not being met for the transportation sector, MTC will adopt additional TCMs within 6 months of the determination. These TCMs will be designed to bring the region back within the RFP line.

MTC will conduct the following process within the 6 month time frame:

- hold an initial public hearing to solicit comments on projects to be delayed and suggestions on additional controls;
- review progress made in implementing controls adopted in the Air Quality Plan;
- analyze additional controls;
- hold a final public hearing prior to adoption of additional measure.

c) <u>Annual Inspection/Maintenance Program</u>

MTC will support legislative authorization for an annual I/M program.

*Designation refers to Caltrans category

APPENDIX I

IMPLEMENTATION COMMITMENTS

RESOLVED, that the Executive Board reaffirms the initial certification of the EIR for the Environmental Management Plan by Resolution 1-78, except as modified by Appendix F of the 1982 Bay Area Air Quality Plan.

The foregoing resolution was passed by the Executive Board this 2nd day of December, 1982.

Attest:

Revan A. F. Tranter

Revan A. F. Tranter
Secretary-Treasurer

Signed:

Ralph C. Bolin

Ralph C. Bolin
President

BEFORE THE BOARD OF DIRECTORS
OF THE
BAY AREA AIR QUALITY MANAGEMENT DISTRICT

In the Matter of Approving the Stationary Source Portion of the 1982 Update of the Bay Area Air Quality Plan /

RESOLUTION NO. 1418

WHEREAS, the Bay Area remains a non-attainment area for both the national primary ambient air quality standards for photochemical oxidants and carbon monoxide;

WHEREAS, if an update of the Bay Area Air Quality Plan is approved by the U.S. Environmental Protection Agency (EPA), the deadline for achieving these national air quality standards may be extended to a date no later than December 31, 1987;

WHEREAS, this District, the Association of Bay Area Governments (ABAG), and the Metropolitan Transportation Commission (MTC) have been designated as co-lead agencies with responsibility for approving the 1982 update of the Bay Area Air Quality Plan;

WHEREAS, a draft of the 1982 update of the Bay Area Air Quality Plan has been prepared by representatives of this District, ABAG and MTC with assistance from personnel of the California Air Resources Board and personnel of the California Department of Transportation and copies of this draft have been made available for public review;

WHEREAS, public hearings before this Board, before ABAG, and before MTC for the consideration of the 1982 update of the Bay Area Air Quality Plan have been properly noticed in conformity

with requirements of federal law;

WHEREAS, this Board has, prior to this date, held two public hearings on the proposed plan and has listened to a number of comments from industry and the public;

WHEREAS, MTC and ABAG have indicated that they may delay approval of elements of the plan which are their primary responsibility pending further analysis of transportation control strategies;

WHEREAS, District staff has urged that any such delay should not interfere with this Board's approval of the stationary source control measures of the plan as distinct from the "transportation control" and other non-stationary source elements of the plan;

WHEREAS, the staff has also recommended that the plan again be updated in 1984;

WHEREAS, the staff has recommended that several changes be made in the draft plan and that several descriptions of control measures be revised; said changes and revisions being attached hereto;

WHEREAS, this Board desires to approve the stationary source element of the plan with the changes and revisions recommended by staff;

WHEREAS, this Board intends to consider the "transportation control" and non-stationary source elements of the plan after they have been approved by ABAG and MTC;

WHEREAS, this Board believes that the stationary source element of the plan, with the changes and revisions recommended by

staff, is the bare minimum necessary to achieve compliance with the federal ozone standard by 1987 and that MTC should be encouraged to garner at least 3 to 5 tons per day of additional hydrocarbon reductions in order to provide a safety margin and thereby ensure compliance with the standard by 1987. Additionally, this Board believes that such additional hydrocarbon reductions should be obtained from both the application of traditional transportation control measures and the rigorous use of new technology applicable to mobile sources; and

WHEREAS, this Board desires that the District staff provide to the Board a semi-annual report relating to the District's advisory review of environmental materials concerning potential projects having an air pollution impact. This report should identify any such projects whose air pollution impact was mitigated or eliminated as a result of the staff's review, and also any such projects whose emission levels were below the review threshold, and should endeavor to quantify the amount of air pollution anticipated from the projects below the review threshold.

NOW, THEREFORE, BE IT RESOLVED that this Board approves the stationary source control element of the draft 1982 Bay Area Air Quality Plan with the changes and revisions recommended by staff attached hereto.

BE IT FURTHER RESOLVED that the Metropolitan Transportation Commission is hereby encouraged to garner at least 3 to 5 tons per day of additional hydrocarbon reductions in order to provide a safety margin relative to achieving compliance with the ozone

standard by 1987, and is also encouraged to obtain such additional hydrocarbon reductions from both the application of traditional transportation control measures and the rigorous use of new technology applicable to mobile sources;

BE IT FURTHER RESOLVED that the District staff is to provide to this Board a semi-annual report relating to the District's advisory review of environmental materials concerning potential projects having an air pollution impact. The report should identify any such projects whose air pollution impact was mitigated or eliminated as a result of the staff's review, and also any such projects whose emission levels were below the review threshold, and should endeavor to quantify the amount of air pollution anticipated from projects below the review threshold.

The foregoing resolution was duly and regularly introduced, passed and adopted at a regular meeting of the Board of Directors of the Bay Area Air Quality Management District on the motion of Director ____Diridon____, seconded by Director ____Ogawa____, on the 6th day of October, 1982 by the following vote of the Board:

AYES: BACCIOCCO, BORT, BRITT, CHAPMAN, CORCORAN, CUNNINGHAM, DIRIDON, DOETSCH, HUGHAN, LANDIS, McPEAK, OGAWA, RUDEE, SILVER.

NOES: NONE.

ABSENT: BOXER, COOPER, DAMONTE, McCORQUODALE.

////

Chairperson of the Board of Directors

ATTEST:

Secretary of the Board of Directors

Date: 10/27/82
W.I.: 902.95.02
W.A.: 5674D
Referred By: WPPRC

Re: Approval of 1982 Bay Area Air Quality Plan

METROPOLITAN TRANSPORTATION COMMISSION
RESOLUTION NO. 1190

WHEREAS, the Metropolitan Transportation Commission (MTC), the Association of Bay Area Governments, and the Bay Area Air Quality Management District have formulated and circulated for public comment a draft 1982 Bay Area Air Quality Plan, said plan being submitted in compliance with the requirements of the Clean Air Act Amendments of 1977 as a revision to the State Implementation Plan; and

WHEREAS, the Metropolitan Transportation Commission has been designated by the Air Resources Board as a Co-Lead Agency for air quality planning in the San Francisco Bay Area in accordance with the requirements of Section 121 and 174 (a) of the Clean Air Act as amended (42 USC Sections 7421 and 7504); and

WHEREAS, the Memorandum-of-Understanding between the Metropolitan Transportation Commission, the Association of Bay Area Governments, and the Bay Area Air Quality Management District assigns to each regional agency, in accordance with its statutory responsibility, the final decision for inclusion of control measures in the Air Quality Plan; and

WHEREAS, the Metropolitan Transportation Commission has included a set of transportation controls in the Air Quality Plan; now, therefore, be it

RESOLVED, that the Metropolitan Transportation Commission adopts the 1982 Bay Area Air Quality Plan, attached hereto and incorporated herein as Attachment A.

METROPOLITAN TRANSPORTATION COMMISSION

William R. "Bill" Lucius, Chairman

The above resolution was entered into by the Metropolitan Transportation Commission at a regular meeting of the Commission held in Oakland, California, on October 27, 1982.

1982 Bay Area Air Quality Plan

(The text for the 1982 Bay Area Air Quality Plan is on file in the offices of MTC, Hotel Claremont, Berkeley, California 94705.)

TRANSPORTATION CONTROL MEASURE IMPLEMENTATION COMMITMENTS

Introduction

The following section references the legal commitments to fund the various programs which are the basis of the TCM's. Many of these commitments are for the current fiscal year only. These will be updated each year in the Annual Air Quality Report.

The Overall Work Program is the commitment to carry out the various tasks described in the document. Once accepted by the federal agencies, it also serves as their commitment to fund this program.

General

The Commission adopted the 1982 Bay Area Air Quality Plan on October 27, 1982, by Resolution No. 1190.

MTC is created by the legislature at Government Code Sections 66500-66522, to provide comprehensive regional transportation planning for the San Francisco Bay Region. MTC is responsible for the development, administration, implementation, and amendment of the Regional Transportation Plan for the Bay Area. MTC is designated the Metropolitan Planning Organization responsible for the conduct of the Transportation Planning Process required by the Federal Aid Highway Act, as amended. MTC is the statutory agency responsible for allocating Transportation Development Act and State Transit Assistance funds to transit claimants in the nine Bay Area counties.

Among MTC's responsibilities are the development of transit service standards--pursuant to Government Code Section 66517.5, the authorization to set tolls on State toll bridges in the Bay Area--pursuant to Streets and Highways Code Section 30886, and the allocation of Ridesharing and Alternative Transportation funds--pursuant to Government Code Section 15933. All of MTC's activities and responsibilities are encompassed in its Overall Work Program.

TCM's Nos. 1 and 2

- The 1982-87 Overall Work Program (OWP), for planning activities in the San Francisco Bay Area (April, 1982), contains Work Element No. 1001.10 (Short-Range Transit Plans and Programs). MTC and the transit operators accomplish the five-year planning activities through this element.

- MTC annually allocates money to the transit operators, to fund their transit operations for the year. Following are the references to the MTC resolutions which funded the six major transit operators for FY 1982-83:

  AC Transit: MTC Resolutions No. 1124 and 1125; May 26, 1982.
  BART: MTC Resolution No. 1123; May 26, 1982.
  Golden Gate: MTC Resolution No. 1097; June 23, 1982.
  SAMTRANS: MTC Resolution No. 1152; June 23, 1982.
  S.F. MUNI: MTC Resolutions No. 1126 and 1127; May 26, 1982.
  Santa Clara Co. Transit: MTC Resolution No. 1151; June 23, 1982.

TCM's Nos. 3 and 6

- Work Element No. 901.50 (Legislative and Regulatory Analysis), in the OWP, describes MTC's legislative efforts. Part of these efforts are directed at securing additional transit funding.

- MTC adopted a set of regional transit capital priorities on May 26, 1982, by Resolution No. 1140. This listing programs the projects which can be implemented with currently anticipated funds, and identifies the projects which will be pursued if additional funding becomes available.

TCM's Nos. 4 and 7

- OWP Work Element No. 1105.60 (Caltrans: Ridesharing Programs) describes the Caltrans efforts in the ridesharing program.

- The California Transportation Commission (CTC) adopted the State Transportation Improvement Program (STIP) on August 27, 1982, by CTC Resolution No. G-84. The Bay Area portion of this program contains the HOV and Park-and Ride projects, which are the basis of TCM's 4 and 7.

TCM No. 5

- OWP Work Element No. 1005.60 (Caltrans: Ridesharing Programs) discusses Caltrans' efforts in the RIDES program.

- RIDES, Inc., adopted their FY 1982-83 budget on February 10, 1982.

TCM No. 8

- This TCM will be implemented through the following OWP Work Elements:

  901.20 (Transit Service Policy Development).
  1001.10 (Short-Range Transit Plans and Programs).
  1005.60 (Caltrans: Ridesharing Programs).

TCM's Nos. 9 and 10

- OWP Work Element No. 902.10 (Commute Alternatives/Ridesharing) describes the MTC efforts to implement these TCM's.

APPENDIX J

SUMMARY OF PUBLIC COMMENTS

SUMMARY OF PUBLIC DISCUSSIONS/HEARINGS ON THE DRAFT 1982 BAY AREA AIR QUALITY PLAN

Date	Meeting
April 23, 1982	BAAQMD workshop on proposed stationary source control measures
May 26, 1982	Joint Air Quality Planning and Advisory Committee discussion of draft plan provisions
July 29, 1982	Joint Technical Staff workshop on the draft plan
August 4, 1982	ABAG Regional Planning Committee review and discussion of draft plan
August 13, 1982	MTC Work Program Committee public hearing on the draft plan
August 26, 1982	ABAG Work Program and Coordination Committee public hearing on the draft plan
September 1, 1982 and September 15, 1982	BAAQMD Board of Directors public hearing on the draft plan
September 7, 1982	Joint Air Quality Planning and Advisory Committee special public hearing on the draft plan held in San Jose
September 16, 1982	ABAG Executive Board public hearing on the draft plan
October 6, 1982	BAAQMD adoption of stationary source portion of the plan
October 27, 1982	MTC adoption of the plan
December 2, 1982	ABAG Executive Board adoption of the plan
December 15, 1982	BAAQMD ratification of the non-stationary source elements of the plan as adopted by MTC and ABAG

Number & Date	Correspondent & Affiliation	Subject	Staff Review, Status & Recommendation
1. Mar 10	Jeff Gabe, Bay Area Clean Air Coalition	Re: 81 Status Report, draft position paper, concerns with over optimistic estimates of tonnage reductions; suggests use of conservative assumptions; suggests staged implementation of control measures--with most cost effective first; suggests use of max. actual emissions instead of quarterly actual emissions; suggests limiting emissions from existing stationary sources to EPA estimate of I&M reductions; concerns with consumer aerosol measure--enforcement and effectiveness; suggests additional stat. source control measures such as--more stringent RACT, electrostatic paint application, electronics industry controls, more stringent NSR, fixed percent reduction from major stat. sources; supports increase commitments to TCMs and suggests new ones.	Draft position paper furnished as BACAC position paper to JAQPAC members by BACAC letter of April 26. Dec 81 Status Report superseded by April 23 Workshop Report on Stat. Sources, May 18 Report to JAQPAC and release of Draft 1982 Plan Update of July 82. Many changes made in these reports. Main ones as follows: control measures for stat. sources expanded and scheduled according to ozone reduction effectiveness. This is a two-stage approach, first for selection and second for implementation. I&M assumption of 29 TPD recommended to and approved by BAAQMD Board at October 6 meeting. List of stationary source control measures expanded and revised to 23 to include 56.3 TPD.
2. Mar 24	Robert Harrison, Western Oil & Gas Assoc (WOGA)	Re: Dec 81 Status Report, letter, requests District hold workshops on plan and control measures for stat. sources; requests stat. source measures be listed by tech. feasibility, cost effectiveness; concern that only 13 stat. measures proposed; concerns that insufficient time provided to review 79 emissions inventory; supports reactivity approach to meas. selection; endorses geographic selection of measures; concerns with 5 out of 13 measures: S-1, S-4, S-7, S-9, S-10.	Dec 81 Status Report superceded by April 23 Workshop Report on Stat. Sources, May 18 Report to JAQPAC and release of Draft 1982 Plan Update of July 82. Many changes made to address concerns in this letter. Main ones as follows; District held a workshop on April 23 on stat. source measures, list of measures expanded to 42 and ranked by cost effectiveness, additional time provided to obtain further updates to 79 emission inventory, reactivity approach incorporated in cost-effectiveness and implementation schedule.
3. Apr 22	Theodore R. Weller, Sr., Wine Institute	Re: April 23 Workshop Report, letter, request that proposed control measure 16, Wineries, be removed from consideration until investigation in Fresno County completed regarding winery emissions.	Measure 16, wineries, removed from needed for attainment list and placed on recommended for contingency list at May 26 JAQPAC meeting.

Number & Date	Correspondent & Affiliation	Subject	Staff Review, Status & Recommendation
4. Apr 22	R.J. Edwards, Mobil Oil Corp.	Re: April 23 Workshop Report, letter, concern that insufficient lead time for making comments; concerns with following measures; 41-New Service Stations, 42-Zero Gap Seals on Floating Roof Tanks.	Measure 41 is on recommended for contingency list, Measure 42 is on recommended for attainment list. Relative ranks maintained at BAAQMD October 6 meeting.
5. Apr 23	Stephen R. Ziman, Chevron, U.S.A.	Re: April 23 Workshop Report, general and specific critique of AQMP process; concern that more workshops be held; concerns that LIRAQ sensitivity runs be made to determine degree to which various control strategies contribute to ozone problem; concern that control technology be better defined, shown to work, be safe; concern that costs have been underestimated; concern that annualized cost methodology ignores important differences between high capital cost-low operating cost measures and vice-versa; concern that cost-benefit ranking be used.	Largely a critique of overall process. Staff has held two workshops - April 23 and July 29. Staff believes more planning workshops would cause unacceptable delay in plan submittal. Individual workshops will be held on control measures before they are implemented. Sensitivity runs have been made along 3 key trajectories, for each control measure - see Table 21 of 82 report. Cost effectiveness ranking employed - see same Table. Rank adjustments made at BAAQMD meetings October 6, 1982 and December 15, 1982.
6. Apr 23	T.S. Wyman, Chevron Shipping	Re: April Workshop Report, letter, suggests a series of workshops; suggests delay until July 1, 82 in light of SB 1732 and delay in ARB report on regulations of vessel air emissions; suggests need to avoid patchwork of local and state regulations because of international nature of shipping; expresses specific concerns with stat. source control measures as follows; 9 - Marine Lightering, 10 - Ship, Barge, Tanker and Rail Car Loading, 30 - Marine Vessel Gas Freeing.	On the suggestion for a series of measure-specific workshops, see response to previous letter. Status of SB 1732 uncertain as this is written, but District will conform to state law. Measures 10 and 30 are presently in contingency status, measure 9 is now unranked pending further study.

Number & Date	Correspondent & Affiliation	Subject	Staff Review, Status & Recommendation
7. Apr 26	F.F. Cooper, Supervisor, Alameda County Director, BAAQMD	Re: April 23 Workshop Report, letter, suggests use restrictions on a time basis for private boats, private airplanes, motorcycles, power lawnmowers; suggests implementation by extension of "burn day" forecasts.	Considered in the write-ups of measures #18 Lawnmowers, #25 Pleasure Boats, and #27 Offroad Motorcycles. Write-ups show both a hardware and use version of these measures. Hardware versions ranked as contingency measures. Use versions indicated as not reasonably available mainly because of difficulty of enforcement.
8. Apr 28	Jeff Gabe, Citizens for a Better Environment	Re: April 23 Workshop Report, letter, expresses approval of development of expanded list of stat. source control measures; concerns with small margin for error in meeting emission reductions of 100-150 TPD; suggests additional reductions may be possible by examining sources subject to Reg 8, Rules 11, 12, 14, 19 and 23 and related coating materials; suggests investigating upgrading of RACT to BACT for some sources; cites electrostatic coating in combination with low solvent coatings rather than on an either/or basis; suggests investigating the possibility for more than wood furniture coating; suggests upgrading RACT requirements for pumps, compressors and fugitive emissions; cites possibility of use of double mechanical seals on pumps and venting of compressors to vapor recovery and fuel gas systems; suggests inspection frequency could be increased for fugitive emissions and repair time shortened; suggests NSR could be made more stringent in various ways - reduce cutoff levels, use different tradeoff ratios for shutdown emissions.	July 82 Draft Plan revised the emission reduction target to 85 TPD instead of the 100-150 TPD in the Dec 81 Status Report. The continuous planning process and annual air quality/RFP reports provide a mechanism to track progress towards attainment and correct if necessary. CBE suggests increased stringency in proposed stat. source measures and addition of new measures, to provide a margin of error for emissions reduction target. Staff prefers implementation of an effective I&M program and reliance on the continuous planning process to achieve an ozone standard which already has a built-in margin of safety. Action by JAQPAC 5/26/82 and BAAQMD 10/6/82 re-ranked and revised stationary source control measures. An estimate of 29 TPD has been included for the biennial I&M program mandated by SB 33 with an increase in stationary source control measures to 56.3 TPD. An update in 1984 is planned to reevaluate and incorporate actual reductions and new information.

Number & Date	Correspondent & Affiliation	Subject	Staff Review, Status & Recommendation
9. Apr 19	R.N. Hazelwood, IT Corporation	Re: April 23 Workshop Report, letter, several comments on proposed stat. source measure 7, Volatile Organic Waste Disposal; concerned with lack of any low cost test on a vapor pressure/percent of VOC basis and lack of knowledge of operating costs; suggests that proposed rule might allow increased volatile organic emissions; calculates cost ratios from $33,000 to $80,000 per ton reduced; suggests increased VOC emissions and costs lead to negative benefits; suggests alternative of limiting concentrations of volatiles to 1%.	Control measure number 7 is on the recommended for attainment list. Staff does not dispute the difficulty of developing a low cost vapor pressure test on a percent VOC limit basis. The District has formed the Volatile Organic Compound/Volatile Organic Waste (VOC/VOW) Committee jointly with ARB and industry to suggest possible approaches. Staff and the committee did not accept the proposed alternative test. The committee has reviewed a number of procedures since the date of this comment letter and recently adopted a "purge and trap method" as a reference method. Staff is now working on development of cost-effective alternative methods. Staff recommends maintaining present control measure 7 and its rank on the attainment list. Staff to rely upon the findings of the VOC/VOW committee regarding test methods, costs, and emissions. Measure revised at BAAQMD 10/6/82 meeting to include Sept. 23, 1982 ARB suggested control measure, proposed for adoption January 1985.
10. Apr 30	Duane B. Bordvick, TOSCO Corporation	Re: April 23 Workshop Report; general comments include concerns that proposed stat. source measures are without sufficient technical, political, social, economic or legal information on overall feasibility; specific comments on measure 7, (Hazardous Organic Waste Disposal) measure 9, (Marine Lightering) and measure 10, (Ship, Barge, Tanker and Railcar Loading); for measure 7 suggests that technology and data base for controlling air emissions lacking; states that needs for measure 7 include an accurate inventory of wastes, accurate analysis of wastes, accurate estimate of emis-	Correspondent has general comments and various critiques of the planning process. The planning process is required to look broadly at all measures and to meet legislative deadlines with good faith efforts. An array of measures must be listed in detail and appropriate to the planning problem and then ranked. Staff has chosen to rank measures by sorting them according to a cost-effectiveness criterion in reducing ozone. The additional detailed information the correspondent seeks is properly a part of the regulation development process, wherein the focus is on a single measure, or a few mea-

Number & Date	Correspondent & Affiliation	Subject	Staff Review, Status & Recommendation
10. Apr 30 ... continued	TOSCO Corporation	sion standard test methods for low vapor pres. mixtures, treatment technology for all wastes, costs, and demonstrated air quality and health impacts; suggests moving implementation schedule back two years and represent emission reductions in a broad range; for measures 9 and 10 suggests many questions about tech. feasibility, safety, legality and local jurisdictional authority; suggest technology for marine vapor recovery not demonstrated; suggests installation of control systems not practical for firms which lease vessels for short-term; suggests consistency in control procedures is essential due to visits at other terminals; discusses consequences of terminating all lightering and loading at Avon wharf; concludes TOSCO would be forced into using smaller and more expensive vessels with a cost-effectiveness at least double figure in draft plan; with regard to ship and barge loading measure 10, suggests TOSCO's only alternative would be to purchase and retrofit its own fleet of ships and barges; would result in significant increase in cost of compliance; suggests that dredging the channels serving Bay Area wharves be considered as a way to reduce lightering emissions; suggest that dredging would also reduce lightering outside the Bay; recommends industry be given additional time and opportunities to provide detailed input for development of the measures.	sures, via workshops and Board hearings. Flexibility resides in the notion of continuous planning and the requirement to produce an annual air quality/RFP report, to adjust emission targets and proposed new control measures in any future year. Action by BAAQMD 10/6/82 included a 1984 update in the planning process, to reevaluate and incorporate actual reductions and new information to revise needed control measures. Measure 39 (Develop and Tighten Plant Emissions) is presently on the not recommended for attainment list. Measure 7 (Volative Organic Waste Disposal) is presently recommended for attainment, measure 10 (Ship, Barge, Tanker and Railcar Loading) is presently recommended for contingency, and measure 9 (Marine Lightering) is unranked on contingency list pending further study. With regard to 7, see reply to previous letter. Re. the comments on measure 9 and 10, staff is aware of the operating and safety factors which complicate use of vapor balance methods. Both measures were revised and/or reranked by BAAQMD action 10/6/82, recognizing stated concerns. Measure 39 is on the not recommended for attainment list.

Number & Date	Correspondent & Affiliation	Subject	Staff Review, Status & Recommendation
11. April (undated)	Dean Simeroth, California Air Resources Board	Re: April 23 Workshop Report. Comments on selected proposed measures: #10 - loading railcars should be controlled under existing regulations; #13 - reduction on tanks >10,000 gallons would equal difference between vapor balance control and internal floating roof; #34 - would require modification of boat fuel systems, difficult to estimate cost and get safety endorsement; #40 - would require modification of airplane fuel tanks, difficult to get safety endorsement (but truck loading may be controlled); #41 vacuum assist only 1-2% more effective than vapor balance.	Measure 10 moved to contingency list. Railcar loading covered in 8-2-114 and 8-6-301 of District Regulations. A specific rule would help with administrative and enforcement tasks. Emission reduction for 13, VOC storage, will be reviewed. Measures 34 and 40 moved to not reasonably available status. Measure 41 on contingency list; cost-effectiveness calculation is based on marginal improvement from vacuum assist.
12. May 16	D.A. Williams AERVOE-PACIFIC Co.	Re: April 23 Workshop Report. Supplementary comments on measure 8: estimate only 5 TPD subject to control; organic propellants sometimes serve as carrier/diluent, so organic content necessary even if propellant changed. Opposes regional regulation of products. Opposes value judgement that aerosol products are undesirable or unnecessary.	Measure was revised by BAAQMD 10/6/82 with new title "Consumer Solvents" to include aerosol products and other non-aerosol consumer products. Measure now expected to yield 4 TPD hydrocarbon emission reduction. Staff research and industry workshops will be held to set different VOC limits for different kinds of products.
13. May 7	R.W. Davis, Chevron U.S.A.	Re: April 23 Workshop Report, urges holding of additional workshops before including any of cited measures in 1982 Air Quality Plan; indicates listed measures that affect Richond refinery; encourages close look at entire list of measures before attempting to rank them by cost-effectiveness; suggests delaying planning process until 1982 emissions inventory update complete; specific comments on measures: 1 - Organic Chemical Mfg; correspondent calculates high cost-effectiveness,	Staff held two workshops - April 23 and July 29, and believes additional workshops would cause unacceptable delay in plan submittal. Individual control measures will be developed through workshops during regulation development. The control measures have been ranked by sorting according to cost-effectiveness in reducing ozone; list of measures was expanded to 42. Many concerns addressed in revising and reranking measures (JAQPAC 5/26/82 and BAAQMD 10/6/82).

Number & Date	Correspondent & Affiliation	Subject	Staff Review, Status & Recommendation
13. May 7 ... continued	Chevron U.S.A.	from $19,000 to $47,000 per ton of HC reduced; 7 - Volatile Organic Waste Disposal; Chevron U.S.A. operates a landfarm and there is no commercially demonstrated treatment alternative to landfarming of refinery oily wastes composed of oil, water, and solids with a high content; concludes emission reductions cannot be estimated because amount of current emissions unknown; 10 - Ship, Barge, Tanker and Railcar Loading; states vapor recovery technically feasible for railcar loading; calculates costs of $8,000 to $9,000 per ton; estimate of about 30 tons per year reduction; 13 - VOC Storage; states measure technically feasible; calculates costs at $1,300 to $4,400 per ton; estimate of about 10 tons per year reduction; 35 - New Source Review; correspondent states that further tightening of already stringent NSR rule inappropriate-inclusion of this measure contradicts earlier BAAQMD claims--not approvable by EPA because emission reduction not quantifiable; measure not cost-effective; seriously questions cost estimates; 39 - Develop and Tighten Plant Emission Limits; states do not know where these emissions would come from; questions cost-effectiveness calculations; 42 - Zero Gap Seals on Floating Roof Tanks; states measure is technically feasible; states cost to replace affected tank seals at Richmond refinery is $190 million; no method to calculate tank emissions from RFI Weatherguard vs other seals; questions estimate in report of 1.5 TPD; concerns with method for determining costs and cost-effec-	Staff reviewed the 1981 inventory; base emissions were similar to 1979 inventory. 1979 base year used because it was favorable for LIRAQ analysis compared with actual measured values. Comments on specific measures: 1 - Organic chemical plants in refineries are not regulated by this control measure. 7 - See response to comment 9. 10 - Concerns acknowledged; moved to contingency list by BAAQMD action 10/6/82. 13 - On smaller tanks (20-40,000 gal), agree control costs about $4,000 per ton. Measure affects tanks >40,000 gal. between 0.5-1.5 psia and >10,000 with stock stock >1.5 psia. 35 - Measure on contingency list; agree regarding high cost-effectiveness. 39 - Considered not reasonably available. 42 - Comments noted; potential reduction 1.2 TPD. Regarding cost-effectiveness comments, staff agrees there may be differences in capital, depreciation, and varying operating costs; approach takes a common denominator for cost-effectiveness determination. Difference in each operation affected requires averaging. 12 years is also average assumption of expected equipment life for many industrial sources.

Number & Date	Correspondent & Affiliation	Subject	Staff Review, Status & Recommendation
13. May 7 ... continued	Chevron U.S.A.	tiveness; states basic four-step approach is good; concerns that first step lumps capital and operating cost ratios; states 12% discount rate not consistent with assumming before-tax costs; states number of years in the equations for equivalent annual cost must be expected equipment life, not fixed at 12 years; recommends changes in definitions and assumptions; attaches example calculation based on these definitions and assumptions.	
14. May 11	D.J. O'Reilly, Chevron Chemical, Richmond	Re: April 23 Workshop Report. Concerns about Measure 15-Pesticides: emissions estimates based on ARB report are too high; some pesticides incompatible with water carrier; formulation may require new registration. Weed oil was greatly reduced, but still needed for some applications; BAAQMD should review emission estimates before developing regulation.	Measure 15 is considered reasonably available. Weed oil use and projections may be updated in ARB's 1982 inventory. Estimates were revised by BAAQMD 10/6/82, and may be revised after work is completed by the ARB pesticide task force and UC Davis.
15. May 26	William L.Chase,Jr. Ortho, Chevron Chemical Company	Re: May 18 Air Quality Advisory Committee Report and April 23 Workshop Report: comments on measure #15, Pesticides: suggests adding clarfication that home use products would not be controlled; notes that many household cleaners are legally defined as pesticides; notes "non-synthetic" includes biological pesticides; comments on measure #8, Aerosol Cans: notes home pesticides would be controlled through this measure; the total elimination of organic solvents as propellants is not possible.	Measure 15: Appropriate exemptions and clarifying language will be incorporated into the rule when it is developed. It is not the intent to control home usage nor to prohibit biological pesticides. Measure 8 was revised and retitled "Consumer Solvents" by BAAQMD 10/6/82 to include many consumer products. Specific products will be evaluated in the regulation development process. Products exempted from Measure 15 may be included in Measure 8.

Number & Date	Correspondent & Affiliation	Subject	Staff Review, Status & Recommendation
16. Jun 4	Dirk Verhagen, Western Aerosol Information Bureau, Inc.	Re: Comments on measure #8 (Aerosol Cans): emissions from aerosol cans should be separate from household items; emissions estimate too high; reactivity should be more closely examined, CO_2 and nitrogen are not viable alternatives; concerned with public effects; encloses copy of South Coast AQMD proposed measure for aerosol cans.	See response to comment 21.
17. Jun 15, 18	Dupont Corporation	Re: April 23 Workshop Report, letters commenting on measure 14 (automobile refinishing) and 28 (industrial maintenance coating); suggests exempting automotive refinishing shops until 1991 because of time needed to test, develop, replace paints currently used. Similar concerns on measure 28; many diversified types of coatings are required by small users; challenges cost-benefit analysis; suggests delaying date of implementation.	Measure 14 requires enclosure of painting area, lower solvent laquers and enamels and/or alternative control methods to achieve 50 to 90% emission control on the effluent stream. Alternatives to reformulation are included in the measure, with specific exemptions to be developed in workshops/regulation development. Staff supports maintaining rank order of measure 28 due to its cost-effectiveness. Costs may be higher than estimated; this will be reevaluated in the 1984 update and in the regulation development process.
18. Jun 30	J.F. McKenzie, P.G.& E. San Francisco	Re: Proposed control measure #42. Concern that measure 42 reference to 30 psi (for zero gap seal pressure) would be incorporated into a regulation. Some PG&E tanks could not accommodate 30 psi. Suggests that control measure specify seal pressure as a percent of allowable tank wall values.	Measure 42 considered reasonably available. Comment on possible overpressure is accepted; tank pressure limits will be considered in regulation development process.
19. Jul 29	Charles D. Madison, Dir. Bulk Petroleum Crowley Maritime Corporation	Re: April 23 Workshop Report, letter requests basis for: 1) Source Inventory Data, 2) Costs and calculations for cost effectiveness, and 3) Basis of reduction calculations for source control measures as follows: #9 - Marine Lightering	Staff furnished requested data in a letter to Crowley Maritime Corporation dated 20 Aug 82. At Crowley Maritime Corp. (C.D. Madison) request District staff met with Chevron Shipping and Crowley Maritime personnel at District office 27 Aug 82. Main points of discussion were: 1) Coast Guard had legal jurisdiction.

Number & Date	Correspondent & Affiliation	Subject	Staff Review, Status & Recommendation
		#9 - Marine Lightering #10 - Ship, Barge, Tanker and Rail Car Loading #30 - Marine Vessel Gas Freeing	1) Coast Guard had legal jurisdiction. 2) "Short Loading" (i.e. increased ullage) is not effective in reducing emissions. 3) Vapor balance for lightering is very complicated (safety, diversity of vessel type and flexibility) and could cost 35 times staff calc. since a new vessel @ $25 million would have to be built. 4) Example of Exxon's Hondo Marine Vapor Recovery discussed by Chevron as costing $30,000/ton control and was owned and operated by refinery personnel. 5) Chevron suggested that the Coast Guard's new edict (EPA 33 CFR Part 157) requiring 20,000 to 40,000 DWT to have segregated ballast tanks or crude oil washing system by 1 Jan 86 would control more than #9 and #30. Measure 31 (Tanker Ballasting) is included per Coast Guard requirements, with an estimated reduction of 2.5 TPD. Action by BAAQMD 10/6/82 and JAQPAC 5/26/82 moved measures 9, 10 and 30 to contingency list in response to safety, cost and jurisdictional concerns.
20. Jul 29	Susan Kauffman, Western Oil and Gas Assn.	Re: Draft 1982 Bay Area Air Quality Plan - April 23 Workshop Report. Letter states 1) WOGA maintains that states and local air districts do not have authority to regulate emissions from marine vessels if such regulations would impact vessel operations or require vessel modification. 2) Doubts that #9 will reduce hydrocarbon emissions unless barges are fully loaded. 3) Recommends that measures #9, #10 and #30 be classified as "Not Reasonably Available."	Staff discussed these issues with the author; agreed that further discourse would be handled in a District staff meeting with Crowley Maritime and Chevron shipping 27 Aug 82 as indicated in item 19 above.

Number & Date	Correspondent & Affiliation	Subject	Staff Review, Status & Recommendation
21. Aug 10, 17	Tom Probst, Western Aerosol Information Bureau, Incorporated	Re: Sept. 1 BAAQMD hearing on Draft 1982 Plan. Comments on measure 8 (Aerosol Cans); states propellants would be replaced by other volatile organic compounds in most products, resulting in reduction of no more than 0.4 tons per day of hydrocarbons; industry has replaced propellants with CO_2 and N_2 where feasible already because of economic incentives; disputes total potential control figure as being too high; assumptions made in cost effectiveness/impact analysis too low; estimates actual cost per ton at $11,742 because of above-stated factors.	Control measure 8 (renamed Consumer Solvents) was revised 10/6/82 by BAAQMD. The measure was expanded to include other categories of consumer products, and is expected to yield 4 TPD hydrocarbon emission reduction rather than the 3 TPD previously estimated for aerosol can control. Cost effectiveness is estimated at $500 per ton. Emissions will be reduced by lowering the reactive organic content in consumer products wherever possible, and products will be studied on an item-by-item basis to ascertain which can be reasonably changed to reduce emissions on a cost effective basis.
22. Aug. 30	Ernestine De Falco, League of Women Voters of the Bay Area	Copy of statements made to MTC and ABAG re. 1982 Plan Update.	Referred to ABAG and MTC.
23. Aug 30	Eve E. Bachrach, The Cosmetic, Toiletry and Fragrance Assn., Inc.	Re: Sept. 1 BAAQMD hearing on Draft 1982 Plan. Comments on measure 8 (Aerosol Cans); opposes hydrocarbon aerosol ban; would affect nationwide manufacture of products; some products not usable in other forms; a similar ban was rejected by South Coast AQMD in 1981; other propellants are already being used where technically feasible; recommends all cosmetics and consumer products be exempted; reduction from this measure insignificant compared to potential reduction from other measures.	See response to comment 21.

Number & Date	Correspondent & Affiliation	Subject	Staff Review, Status & Recommendation
24. Aug 30	Ralph Engel (presented by L. Gallo, Chemical Specialties Manufacturers, Assn.	Re: Sept. 1 BAAQMD hearing on Draft 1982 Plan. Comments on measure 8 (Aerosol Cans); measure discrimates against aerosol cans and ignores solvents in non-aerosol products; hydrocarbon propellants are an insignificant contribution to total atmospheric hydrocarbons; cost would be 60 times greater than estimated by the measure; disrupts interstate commerce in the aerosol industry.	See response to comment 21.
25. Aug 31	William Sylte, California Air Resources Board	Re: July 82 Draft Bay Area Air Quality Plan, letter with attachment, six general suggestions in cover letter; four specific concerns in considerable detail in attachment; cover letter suggestions for analysis: 1) adjust I&M assumptions to reflect biennial program; 2) establish additional contingency measures, assuming present set exhausted in response to changed I&M assumption; 3) consider downwind effects of NOx emissions, including interbasin transport; 4) enhance New Source Review rule; 5) further refine administrative measure regarding plan and project approval; 6) clarify provision for ongoing planning to show responsibility and schedules.	New I&M planning assumption is 29 TPD ROG reduction. Stationary source measures ranked 22 and 23 moved to reasonably available list. Eleven contingency measures remain, because emission reduction target of 85 TPD is achievable with shift of just auto refinishing - Rank 22 - and letterpress/offset printing - rank 23 to reas. available list. With clarification of specifics for ongoing planning, staff sees no need to augment remaining 11 contingency measures. Baseline 1987 NOx emissions are reduced a net of 100 TPD from 1979. Similarly baseline 1987 ROG emissions are reduced a net of 215 TPD. With these reductions plus the additional 85 TPD ROG reduction from the plan, staff does not believe interbasin NOx transport is a significant issue. However staff is seeking sup-

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25. Aug 31	Air Resources Board ... continued		port to extend LIRAQ analyses to neighboring APCDs, as part of a 1984 update (see response to suggestion 6). Rules were selected based on a cost-effectiveness index and related ranking. The plan is designed to provide a minimum cost-maximum reactivity solution to attainment, based on the c/e index. Staff understands that much more stringent NSR rules can be devised, but the essential question is will such rules have a better c/e ratio? CARB does not address this point. Staff judgment is that the ratio would not significantly change. Staff recommendation is keep present language for measure number 35, New Source Review. Measure regarding plan and project approval is advisory so staff judges flexibility exists to work out emissions levels warranting review, jointly with ABAG, MTC and CARB. Staff recommends that the plan include a commitment to update by October 1, 1984. This commitment is to be at the same level of effort as the present 1982 update. Thus it will include new emissions inventory, new meteorology and new LIRAQ modeling. Such a commitment goes well beyond annual assessments of reasonable further progress (RFP), which will be made in other years.

Number & Date	Correspondent & Affiliation	Subject	Staff Review, Status & Recommendation
26. Aug 31	William L.Chase,Jr., Chevron Chemical Co.	Re: Sept 15 BAAQMD hearing on Draft 1982 Plan. Comments on measure 15 (Pesticides): definition of pesticide now includes household products; if weed oils banned, measure should be specific so other products (dormant oil sprays for tree crops) not affected; measure not beneficial to Bay Area residents; industry is moving to water based emulsive concentrate formulations because of economic incentives. Comments on measure 8 (Aerosol Cans): propellants are already being replaced because of economic incentives; requests revision of measure to not discriminate against aerosol packaging.	Control measure 15 (Pesticides) was revised on 10/6/82 by BAAQMD. The measure encourages the use of existing synthetic pesticides, and would discourage or prohibit the use of non-synthetic pesticides. Domestic usage of home-garden-type pesticides is excluded from this measure. Specific definitions and exemptions will be developed as part of the technical assessment, workshop and regulation formulation process prior to adoption of the regulation, slated for 1983. Additional information from ARB and UC Davis studies will be evaluated when available. (Also see previous response 15 to Chase's letter.) Control measure 8 was revised and renamed Consumer Solvents by BAAQMD action 10/6/82. The expansion of the rule to include many consumer products addresses stated concerns. (See comment 21 response for details.)
27. Sep 1	George R. Hawkes, Chevron Chemical Co.	Re: Sept. 15 BAAQMD hearing on Draft 1982 Plan. Comments on measure 15 (Pesticides): emissions estimates and implementation schedule were not revised as requested in May 4, 1982 letter, although some changes were made; urges reassessment of emissions estimates; jurisdiction on pesticides lies with agricultural commissioners and not with AQMDs; challenges Wiens and Eureka Lab Report as estimating emissions on the high side due to an error in volatility; weed oil use small in area, and cost-effective material substitution has already been made.	Source inventory estimates of emissions subject to control were lower in the 10/6/82 revision by BAAQMD. Staff believes potential reduction estimates are the same (3.7 tons). As noted in the revised measure, the ARB task force is studying control of pesticide emissions, and can be incorporated in the regulation development process if available. Calif. Admin. Code (Title 3, Section 2445) requires county agricultural commissioners to consult with agencies having jurisdiction over resources affected by pesticide use. Staff understands emissions estimates may be high, and may be revised pending outcome of ARB and UC Davis studies.

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28. Sep 1	Melanie Julian, Loma Prieta Chapter, Sierra Club	Re: Sept 15 BAAQMD hearing on Draft 1982 Plan. Recommends additional contingency measures to be included to target reductions close to 100 TPD; need to reevaluate I&M reductions.	On 10/6/82, BAAQMD Board of Directors adopted the stationary source control measures in the plan. These included 29 TPD reduction for I&M, additional control measures added and some changes in proposed measures to provide 56.3 TPD from stationary sources. The Plan Update in 1984 will provide an opportunity to make corrections in the number of stationary source controls needed, and to evaluate actual reductions achieved by I&M.
29. Sep 1	Western Oil Gas Assn.	Re: Sept 15 BAAQMD hearing on Draft 1982 Plan. Comments on measures affecting marine vessels; questions authority of state and local AQMDs to regulate emission if action would impact operations or require modifications--federal authority is vested in the Coast Guard; measures 26 (Marine Lightering Retrofit) and 10 (Ship, Barge, Tanker, RR Loading) are not reasonably available due to safety considerations, cost, Coast Guard jurisdiction; measure 9 (Marine Lightering) underestimates costs and should eliminate final ullage as a reduction technique; suggests extending measure 31 (Tanker Ballasting) to include vessels between 20-40,000 DWT.	Measure 26 (Marine Lightering Retrofit) has been classified as not reasonably available; measure 9 (Marine Lightering) was revised 10/6/82 by BAAQMD and has been moved to an unranked category in the contingency list because of concerns with technical feasibility and jurisdiction. ARB is preparing a report to address these issues and related problems with measure 10. The measure will be reconsidered during the 1984 AQMP update. Measure 10 was also revised 10/6/82 by BAAQMD and has been moved to the contingency list. Measure 31 requires no action by BAAQMD; U.S. Coast Guard promulgated rule (33CFR, Parts 154-155) effective June 1, 1981 applicable to tankers of size greater than 40,000 DWT.

Number & Date		Correspondent & Affiliation	Subject	Staff Review, Status & Recommendation
30.	Sep 1	Fred Scullin	Re: Sept 15 BAAQMD hearing on Draft 1982 Plan. Recommends measures be included to reduce carbon monoxide emissions from waste burning and incineration from planned facilities.	Emissions from waste burning and incineration were included in LIRAQ ozone modeling. Carbon monoxide emissions from mobile sources (2940 TPD 1979 inventory) greatly exceed point source emissions (264 TPD), are emitted at tailpipe level, and therefore have a dominant effect on ambient concentrations. Control strategies are aimed at mobile sources; San Jose, Oakland and Vallejo have been identified as local exceedence areas. The CO control strategy for mobile sources includes I&M and measures contained in Section V of the Plan.
31.	Sep 1	Roger Beutner, Chemical Specialties Manufacturers Assn.	Re: Sept 1 BAAQMD hearing on Draft 1982 Plan. Comments on measure 8 (Aerosol Cans): measure overestimates current emissions and possible reductions due to control measure; could be an increase in VOC's with nonaerosol alternatives; real cost of control is 60 times that estimated by measure.	See response to comment 21.
32.	Sep 2	K. A. Fulscher	Re: Control measure (Aerosol Cans): supporting measure.	Comments noted; measure retitled "Consumer Solvent" and revised 10/6/82 by BAAQMD to include other categories of consumer products.
33.	Sep 3	Mrs. C.E. Reynolds	Re: Control measure 8 (Aerosol Cans): supporting measure.	See comment 32.
34.	Sep 4	Katherine Janney	Re: Control measure 8 (Aerosol Cans): supporting measure.	See comment 32.
35.	Sep 7	Anne B. Geraghty California Air [illegible]	Re: Sep 7 JAQPAC meeting on Draft 1982 Plan.	Transportation control measures; referred to MTC.

Number & Date	Correspondent & Affiliation	Subject	Staff Review, Status & Recommendation
36. Sep 7	David L. Calkins, Chief, Air Programs Branch, EPA Region 9	A. Control strategies & attainment demonstration: 1-Stationary Sources: Plan contains schedule for rule development, rather than adopted rules; this is acceptable. Suggests the following be considered during the rule development process: - implementation problems at the facility affected; - changes in emission reduction potential; - methods for compliance verification; - methods for RFP tracking; - expansion of Contingency Plan stationary source measures; - administrative options for the Contingency Plan (e.g. limiting extensions on variances and repetitive penalty fees). 2-Inspection & Maintenance: Plan indicates that adoption occurs in 1984, implementation occurs in 1987. Addjust I&M emission reduction credit for biennial program. Final plans needs to include a schedule of adoption and implementation of the following ten elements for I&M: - test procedures, - emission standards, - station licensing requirements, - analyzer specifications, - record keeping requirements, - quality control procedures, - compliance methods, - other factors, - public awareness plan, - mechanics training.	EPA's suggestions regarding stationary sources will be considered during the rule development process, as well as the continuing planning process. Reanalysis of the emission reduction estimates routinely occurs once a rule is adopted. Staff is now developing better ways to assess and track RFP. The final plan indicates adoption in 1982 and implementation beginning in 1984. Adjustment for I&M has been incorporated into the plan recommendations: 29 TPD for HC is now assumed rather than 41 TPD. The Bureau of Automotive Repair, the ARB, the DMV, as well as the District all have the roles to play with respect to the design and implementation of the I&M program. The District anticipates working closely with the state agencies involved in the design of the I&M program. It is not expected that a schedule addressing the 10 elements will become available in time for submission with the final plan, although it should become available shortly thereafter. Transportation control measures are referred to MTC. Regarding RFP, staff is preparing a Technical Memo to document annual average summer day HC emissions, which will be referenced in the final plan. RFP for CO is referred to ABAG, as are other listed concerns regarding CO and conformity assessment. For ozone modeling, a technical memo summarizing air quality data will be amended to include data requested. Average summer day emissions were previously provided to EPA on June 24, 1982. This information will be included in a Technical Memo

Number & Date	Correspondent & Affiliation	Subject	Staff Review, Status & Recommendation
36. Sep 7 ... continued	EPA, Region 9	3-Transportation Measures: EPA has strong reservations concerning the selection rationale for TCMs, especially the criteria used to reject a TCM as not reasonably available. - Include JACPAC Status Report (Jan. 82) with the plan. - Next update of the plan needs to include local jurisdiction commitments. - Include specific schedule and commitment in the final plan for the Downtown Oakland Study (for CO). - Include definition of Basic Transportation Needs (BTN) in the final plan. - Clarify statement in plan that pricing alternatives were excluded to avoid creating unmet BTN. - Proposed TCM monitoring plan is not acceptable and must be revised in the final plan assuming RFP credit is to be claimed for TCMs. - Conformity program is nonspecific in terms of procedures, participants, roles, and responsibilities Consider integrating with program for long term maintenance. - Process for determining/implementing additional TCMs is not acceptable. Final plan needs to specify process including specification of what actions will take place, criteria for triggering the Contingency Plan, participants, and milestones. Consider prioritization of various types of transportation projects.	which will be referenced in the plan. Staff met with EPA on 9/20/82 to discuss methodology for adjusting average summer day emissions. An adjustment to account for the biennial I&M program is being recommended. A brief discussion of the HC speciation study will be included in the Final Plan, especially with respect to how the results affected certain boundary and input conditions of LIRAQ.

Number & Date	Correspondent & Affiliation	Subject	Staff Review, Status & Recommendation
36. Sep 7 ... continued	EPA, Region 9	- CO Contingency measures for Oakland are not acceptable since they lack commitment, are non-specific, or are non-discretionary. Suggests consideration of the "Additional Measures" category as a partial substitute. 4-Reasonable Further Progress (RFP): - Include annual, average summer day HC emissions by control measure in the final plan. - The final plan needs to include source category and year-by-year emission reductions sufficient to demonstrate RFP for CO. - Clarify in final plan if HC reduction credit is claimed for the proposed TCMs. - Specify monitoring program to substantiate RFP credit for CO. 5-Conformity of Federal Actions: - Specific schedules and guidelines for implementing the Administrative Programs for Long-Term Maintenance are needed in order to fully evaluate these programs. - Implementation criteria needs to be provided in order to evaluate the transportation Conformity Program. B. SIP Development Process: - Process is generally acceptable. - The final plan needs to describe the degree of local agency participation in the development of the transportation element of the plan.	

Number & Date	Correspondent & Affiliation	Subject	Staff Review, Status & Recommendation
36. Sep 7 ... continued	EPA, Region 9	- Use of Emission Reduction Targets (ERT) by local jurisdiction would document local commitment and provide a description of specific transportation program activities. C. Air Quality and Emission Data Bases: 1-O_3 Data and Model - The final plan needs to include or reference air quality data for the highest ozone concentration days at each station for the years 1977-1979. - The final plan needs to include the average summer day emissions inventory with projections in a category-by-category basis. - The method used to select the design day for the LIRAQ runs was not consistent with EPA guidance, which relates to EKMA. Since EPA approves the use of LIRAQ for the Bay Area, EPA accepts the alternative methodology used to select the design day. - Explanation of the methodology for adjusting the average sumner day emissions to annual average day emissions should be included with the Final Plan. - The Final Plan should contain an adjustment for I&M since the the State Legislature has authorized a biennial program. - The Final Plan should contain a discussion and summary of the HC speciation study which was conducted in the fall of 1979.	

Number & Date	Correspondent & Affiliation	Subject	Staff Review, Status & Recommendation
36. Sep 7 ... continued	EPA, Region 9	2-Carbon Monoxide Data and Model - All CO emissions inventories (regional, subregional, local) based upon average winter day need to be included or referenced in the Final Plan. - The next update of the plan needs to address the growth of Oakland's Central Business District. - The Final Plan needs to include the projected 1987 emission reductions attributable to I&M for the San Jose Area. - The Final Plan needs to explain the rationale for using only one winter season data for developing the design value. - A demonstration of CO attainment based upon the design value of 18 mg/m3 needs to be included in the Final Plan. - Since the value for Vallejo is selected from the permanent monitoring station, some justification needs to be provided showing that there are no other "hot spots" in Vallejo which would provide a higher value. - The Final Plan needs to describe the criteria for selection of the hot spots monitored and discuss the evidence which indicates that these are the worst hot spots. - The Final Plan needs to include an adjustment for I&M since it is now certain to be biennial. - The Final Plan needs to include a discussion of the rational used to estimate the CO background values.	

a discussion of the rational used to esti[illegible]te the CO background valu[illegible]

Number & Date	Correspondent & Affiliation	Subject	Staff Review, Status & Recommendation
37. Sep 7	Jeff Gabe, Citizens for a Better Environment	Re: Sept 7 JAQPAC meeting on Draft 1982 Plan. Comments on Draft Plan: suggests increasing total hydrocarbon reduction to 103 TPD from 85 TPD to incorporate margin of error; reevaluate I&M; expand list of stationary source control measures; mandatory indirect source review, expand transportation control measures.	Action by BAAQMD 10/6/82 addressed some concerns: I&M effectiveness changed to 29 TPD reduction of reactive hydrocarbons; targeted tonnage for stationary sources 56.3 TPD, with shift in cut-off line to include 23 measures; commitment made to reevaluate reductions in a 1984 update of the Plan. Mandatory ISR and TCMs referred to ABAG and MTC.
38. Sep 7	Ernestine De Falco, League of Women Voters of the Bay Area	Re: Sept 7 JAQPAC meeting; comments on 1982 Draft Plan.	(Same as comment 22.)
39. Sep 10	Steve Ziman, Chevron, U.S.A.	Re: Sept 15 BAAQMD hearing on Draft 1982 Plan. Comments on measure 1 (Organic Chemical Manufacturing): exempt chemical manufacturing plants located within petroleum refineries; measure 19 (Reciprocating Engines): request separate rule for refinery and chemical plant engine replacements due to cost; measure 7 (Volatile Organic Waste Disposal): delay adoption date to 1985 to incorporate information being developed.	Measure 1 does not apply to refinery organic chemical plant sources, which are regulated by existing Regulation 8 rules 10, 18, 25 and 28. Measure 19 applies to new gasoline-powered engines, and would not affect existing equipment. Measure 7 was revised 10/6/82 to conform with date of adoption of ARB control measure to reduce emissions from volatile organic waste disposal.
40. Sep 10	William Peters, Monterey Bay Unified Air Pollution Control District	Re: Comments of Draft 1982 Plan. Concerns regarding transport of contaminents to area from BAAQMD; suggests accelerating stationary source controls to require 75% reduction by 1984; TCMs also implemented early so adjustments may be made prior to 1987; disagrees with LIRAQ HC/NOx assumptions; suggests more stringent NSR rule; questions how 20 TPD addition due to biennial I&M will be handled.	Most concerns were addressed in M.Feldstein's letter of 9/23/82 to Director Rod Diridon. Action by BAAQMD on 10/6/82 changed I&M effectiveness to 29 TPD reduction of reactive hydrocarbons and targeted tonnage for stationary sources to 56.3 TPD, with shift in cut-off line to include 23 control measures. Also see comment 52.

Number & Date		Correspondent & Affiliation	Subject	Staff Review, Status & Recommendation
41.	Sep 13	Eve E. Bachrach, The Cosmetic, Toiletry and Fragrance Assn.	Re: Control measure 8 (Aerosol Cans); letter correcting previously submitted figures on hydrocarbon in shaving cream.	Comment noted.
42.	Sep 24	John C. Middleton, U.S. Borax Research	Re: Control measure 15 (Pesticides): requests clarification of "non-synthetic"; boric acid is included in federal and state regulations as a pesticide.	The measure would control volatile organic emissions from pesticides, and is not intended to include disinfectant products using boric acid. Specific exemptions and language will be identified in the workshop/regulation writing process. Comment noted.
43.	Sep 14	Barbara E. Price, Dana Fuller Mfg.	Re: Sept 15 BAAQMD hearing on Draft 1982 Plan. Comments on measure 19 (Reciprocating Engines): outlining need for gasoline powered engines as a temporary source of power for the media.	Measure would control types of new gasoline engines, banning sale of most new 2-stroke engines, and controlling emissions from new 4-stroke engines. Measure would not limit the use of gasoline engine generators.
44.	Sep 15	Bay Area Clean Air Coalition	Re: Sept 15 BAAQMD hearing on Draft 1982 Plan. Presented by Jeff Gabe; position paper May 1982.	See comment #1.
45.	Sep 15	Paul E. Jacobs, Citizens for a Better Environment	Re: EPA vs CARB/SCAQMD Vehicle Inspection and Maintenance program efficiency comparison.	Response: Tonnage estimates for I&M were revised after passage of SB 33, now expected to yield 29 TPD reduction of reactive hydrocarbons.
46.	Sep 15	Edward Hilko, American Can Co.	Re: Sep 15 BAAQMD hearing on Draft 1982 Plan. Comments on measure 8 (Aerosol Cans): opposes banning of aerosol cans using hydrocarbon propellants; economic hardship does not justify minimal reduction in hydrocarbons.	See response to comment 21.

Number & Date		Correspondent & Affiliation	Subject	Staff Review, Status & Recommendation
47.	Sep 15	Jeff Gabe, Citizens for a Better Environment	Re: Sept 15 BAAQMD hearing on Draft 1982 Plan. Comments same as #37; presented a copy of the State of Minnesota Indirect Source Regulation.	See response to comment 37; ISR regulation referred to ABAG.
48.	Sep 27	David Magid, Enviro-Spray Systems, Inc.	Re: Comments on control measure 8; description of propellant system using CO_2.	Comment noted. Measure 8 retitled and expanded to cover consumer solvents.
49.	Sep 22	Debra Lynn Dadd	Re: Sep 15 BAAQMD hearing on Draft 1982 Plan. Supporting measure 8 (Aerosol Cans) and encouraging ban of other products.	Comment noted. Measure 8 retitled and expanded to cover consumer solvents.
50.	Sep 22	Max Mason, Bay Area League of Industrial Assn, Inc.	Re: Comments on Draft 1982 Plan. Supporting air quality planning process and adoption of Plan; industrial growth projections overestimated as these are subject to NSR; requests formal status report be issued annually.	The stationary source controls in the Draft Plan were revised and adopted by BAAQMD Board 10/6/82. An update will be conducted in 1984 to evaluate status of control measures and progress toward attainment.
51.	Oct 5	John W. Hagerty, State Solid Waste Management Board	Re: Control measure 29 (Sanitary Landfill Sites). Request implementation schedule be slowed pending SSWMB study of landfill gas migration; 7.2 TPD estimate based on inadequate data; cost will adversely affect development of needed future capacity.	Staff recognizes uncertainty of estimates and will revise as better data become available. Measure is slated for implementation in 1985; additional information will be included during the 1984 Plan Update and the regulation/workshop process. Projects similar to proposed measure are currently operating in the Bay Area, and operating data from these can be evaluated in the development of the regulation.

Number & Date	Correspondent & Affiliation	Subject	Staff Review, Status & Recommendation
52. Oct 5	William Peters, Monterey Bay Unified Air Pollution Control District	Re: Response to M. Feldstein letter to R. Diridon 9/23/82 answering Peters' 8/10/82 concerns. States transport of ozone and precursors may create violations in the Monterey Bay basin, agrees NO may quench ozone and photochemical conversions to O_3 are slow, and that control of NOx/NO_2 correctly assessed for localized O_3 scavenging; again suggests LIRAQ modeling be extended; in 1984 Plan update, reconsider higher offset ratios for hydrocarbon and NOx, also NOx control strategies for reduction of ozone.	Proposal to study transport has been furnished to ARB, and will be undertaken if funded. Staff supports responses in 9/23/82 letter to Director Diridon, and notes suggestions for the 1984 Plan update.
53. Oct 5	Peter B. Giles, Industry Environmental Coordinating Committee	Re: Use of vehicle emissions from employer-sponsored commute alternative efforts as a trade-off credit for stationary source emissions.	Referred to ABAG and MTC.
55. Oct 14	Jeff Gabe, Citizens for a Better Environment	Re: Enclosed comments of Steve Dreistadt 10/6/82 re. measure 15 (Pesticides): estimated reductions from incomplete data, proposed ban on some non-synthetics, may increase health and environmental effects; suggests reformulation and use reduction of urban pesticides--heaviest use by homeowners, public agencies, business and industry; includes aerosol products exempted by measured 8; CO_2 propellant should be encouraged; usage figures not accurate.	Emissions estimates may be too high, but are based on past ARB estimates, may be revised after ARB pesticide task force and UC Davis studies are completed. Hazards of reformulation are also being studied by ARB's task force. Domestic use of home/garden-type pesticides is excluded in proposed measure 15, but is included in measure 8 (now titled Consumer Solvents). New data will be incorporated as available in the regulation development process.

Date	From	Subject	
8/13/82	Jeff Gabe Citizens for a Better Environment	Re: Transportation target Additional reductions could be obtained from TCMs.	The region has already made a major commitment to TCMs, particularly transit. MTC conducted a thorough analysis of TCMs and concluded that additional travel reductions which can be expected are quite small. This was borne out by experience with the 1979 gas shortage, where weekday travel decreased by only 8% even though motorists had to wait in lengthy lines for gas.
		Re: Emission reduction target for hydrocarbons The Plan should attempt to reduce hydrocarbons by more than 85 tons to account for uncertainties.	The 85 ton target is based on the best information available. The Plan results will be monitored annually, and there is a mechanism for revising the Plan if the target is incorrect.
		Re: HC/NO_x Ratio The HC/NO_x argument does not take into account the LIRAQ model's uncertainties or the effects of long-range transport.	A substantial effort was made to validate the LIRAQ model. Although there are uncertainties, this is the best estimate we have at this time. There is still debate about the effects of long-range transport, and it is uncertain what effects emission reductions in this region would have.
		Re: Public Review The process of public review has been somewhat disjointed and insulated from the public.	Several public reviews were scheduled. To obtain the maximum public input within this constraint, an additional public hearing was held in San Jose.
8/13/82	Alan McCuen CalTrans Division of Transportation Planning	Re: Documentation Supporting documentation is needed for the emission reduction estimates.	Additional documentation was provided to the ARB and Caltrans in a separate memo.
		Re: Implementing authority Implementation actions should be identified by jurisdiction.	Appendix I contains implementation commitments.
		Re: Contingency Measures Plan should include contingency measures which can be implemented in a short time period.	The contingency plan for transportation sources outlined a process for selecting additional controls if it is determined that reasonable further progress is not being met. MTC believes that this process is preferable to identifying specific measures now because it can account for any changes which occur in the transportation environment.
		Re: Additional TCMs The final Plan should contain greater development of the ARB recommended measures.	MTC staff has met with ARB staff in an attempt to better define their proposals.

Date	From	Subject	Staff Review, Status & Recommendations
8/13/82	Alan McCuen CalTrans Division of Transportation Planning (continued)	Re: Adoption Process	
		The final Plan should include a provision for local adoptions.	MTC will be responsible for coordinating local actions on the TCMs. Given the number of local jurisdictions in the Bay Area, it would be very time-consuming to get local adoptions.
		Re: TCMs adopted in 1979 Plan	
		TCMs 1, 4, 5, 6, 7 were included in the 1979 Plan and should not be included separately in the 1982 Plan.	Because MTC is reaffirming these measures, it is appropriate to include them.
		Re: Transit Improvements	
		The productivity improvements associated with TCM #2 should be identified. The service expansions associated with TCM #3 should be identified.	The entire list of improvements is contained in the transit operators' five-year plans. Examples of these improvements are listed in the "Description of Proposed Control Measures" (8/13/82).
		Re: Ridesharing Funds	
		TCM #9 should be expanded given the ridesharing funds which will be available from SB 320.	The use of the SB 320 funds is being discussed by the Regional Ridesharing Group, which is composed of ridesharing agencies in the Bay Area. It appears that part of these funds may be used to make up cuts in other state funds.
		Re: Parking Ordinance	
		The proposed parking measure could be expanded to include development of a model ordinance.	This was included in the new measure.
		Re: Bicycle Measure	
		The proposed bicycle measure could include Caltrans bicycle projects, provision of facilities at employment sites, and an education program for local governments.	This measure relies on the draft bicycle plan, which does not contain specific projects. It does, however, define the overall policies for encouraging bicycle use.
		Re: Commute Alternatives	
		The Commute Alternatives Program should specify the number of eligible employers and the expected rate of employee participation at each site.	The Commute Alternatives Program places no eligibility restrictions on employers. Estimating employee participation in advance for each site would be very costly and have little discernible benefit.
		Re: Vehicle Idling Controls	
		CEQA review and comment would have little effect on restricting drive-through facilities.	The City of Berkeley has used this process effectively for this purpose.

Date	From	Subject	Staff Review, Status & Recommendations
8/13/82	Alan McCuen CalTrans (Continued)	Re: Fleet Vehicle Program	
		The fleet vehicle measure could be expanded significantly at low cost. An example is the methanol vehicle fleet acquisition program.	The suggested examples are being pursued at the state level. This is appropriate, since this permits better information to be developed with fewer resources.
8/13/82	Michael Seaman & Ann Geraghty, California Air Resources Board	Re: Documentation of Analysis	
		More documentation of emission reductions is needed.	MTC prepared a memo documenting the assumptions behind the analysis.
		Re: Short trip strategies	
		Additional measures aimed at reducing the number of short trips could be added to the plan.	Trip-end emissions were considered separately in the analysis. Strategies such as the bicycle program were found to be effective for this reason.
		Re: CO contingency plans	
		Because of the uncertainty about I/M effectiveness, the South Bay Cities and Santa Clara County should form a task force to develop a strong CO contingency plan.	ABAG has formed a task force from the South Bay to monitor air quality problems in that area.
		Re: HC Contingency Program	
		A strong contingency program for HC is needed to address the I/M uncertainties.	ABAG, BAAQMD, and MTC staff revised the contingency plan in light of the recent passage of SB 33.
		Re: Local involvement	
		Local jurisdictions need to be involved in the development of TCMs.	A new TCM (#10) was added to the Plan to address this concern.
8/13/82	Fred Scullin	Re: Disincentives	
		TCMs should not penalize the motorist.	The proposed TCMs are designed as incentives for alternative modes. Because the emission reduction effectiveness of the TCMs is quite small, measures designed to penalize the motorist would not be proposed unless they had other benefits.
		Re: Transit	
		Bus stops should be placed further apart to increase the average speed of the bus.	Close spacing of bus stops is provided only on local routes. Express bus routes and BART are available for longer trips at higher travel speeds.
8/25/82	Adelia Sabiston, League of Women Voters	Re: Land Use Controls	
		Transportation related land use measures should be included in the plan.	MTC does seek to encourage land use developments which are compatible with transit service. It is hoped that the Advisory Indirect Source Review program will strengthen this effort.

Date	From	Subject	Staff Review, Status & Recommendations
9/7/82	Anne Geraghty, California Air Resources Board	Re: Commute Alternatives Targets should be established for employee participation, percent of commuters on bicycles, etc.	MTC has endorsed the general objectives of the ARB staff in the Plan without claiming any emission reduction credits.
9/7/82		Re: Local Implementation	It is intended that the local government information manual would discuss the specific actions cities can take to reduce air pollution and alleviate transportation problems.
9/7/82	Frank Harris, RIDES for Bay Area Commuters, Inc.	Re: Ridesharing Measures The TCMs could be strengthened by emphasizing parking programs for carpools and vanpools and encouraging transit through the local government manual.	The proposed parking programs are intended to provide preferential treatment for HOVs. The local government manual will provide information on all alternative modes.
9/7/82	Peter Giles, Santa Clara Co. Manufacturing Group	Re: Transportation vs. Industrial Controls A greater effort on transportation controls would relieve the need for additional stationary source controls.	Transportation and stationary source controls cannot be easily interchanged in the Plan, since the former reduces both HC and NO_x while the latter can be designed to reduce HC alone. The ozone reduction is less when both pollutants are reduced.
9/7/82	Artemas Ginzton, Santa Clara Co. Trails Committee	Re: Bicycle Measure The bicycle measure needs to be strengthened with goals identified.	The bicycle measure was combined into the new measure to encourage local involvement. We anticipate that this will improve the effectiveness, since this type of program can best be implemented at the local level.
9/7/82	Dave Calkins, U.S. Environmetnal Protective Agency	Re: Reasonably Available TCMs The selection rationale for TCMs, particularly the rejection criteria, is not specified very well.	The analyses of TCMs showed that significant travel reductions were unlikely to be achieved from these measures. Land use form and density are much more critical factors. For this reason, MTC chose measures which encouraged alternative modes, rather than ones which penalized auto travel. The TCM effectiveness is specified in Appendix B of the Plan. An additional memo has been prepared which details the assumptions behind all the measures which were considered. In addition the Commission has included its policy creteria in the Region Transportation Plan.
9/7/82		Re: Commitments/Schedules Local jurisdiction commitments are needed.	MTC has added a measure to involve local jurisdictions in Transportation System Management (TSM) efforts. MTC has lead responsibility for this measure and will produce a handbook and conduct an outreach/training program for local governments.

produce a handbook and conduct an outreach/trai-ing
Program for local governments

Date	From	Subject	Staff Review, Status & Recommendations
9/7/82	Dave Calkins, U.S. EPA (Continued)	Re: Basic Transportation Needs	
		Discussion of BTN should should reference the definition used by MTC.	MTC requires the operators to address transit needs in their Five Year Plans. A discussion of this has been added to the Plan.
		The MTC guidelines on pricing appears to indicate that this category of measures was excluded to avoid creating unmet Basic Transportation Needs.	This was not the intent of the pricing guidelines. The guidelines essentially sets priorities as to where pricing measures would best be employed. Thus, if pricing measures were necessary, they would first be considered for areas with a high level of alternative transportation services.
		Re: Monitoring Plan	
		If RFP credit will be claimed for the TCMs, the monitory plan must be revised.	Where it is possible to measure the effectiveness of individual TCMs, it will be done. The monitoring plan has been revised in the Final Plan to reflect what can actually be measured with currently available data.
		Re: Transportation Conformity	
		The Transportation Conformity Program lacks descriptions of procedures, participants, roles and responsibilities.	The description was expanded in the Final Plan to address these concerns.
		Re: Contingency Provision	
		The process described in the draft Plan is only a commitment by MTC to develop a Contingency Procedure.	The process described in the draft Plan is meant to be a contingency procedure, since it is a commitment to analyze and adopt additional TCMs within 6 months of a determination that RFP is not being met. The description was expanded in the final Plan to clarify this.
9/7/82	Alan McCuen, CalTrans Division of Transportation Planning	Re: Alternative Engines and Fuels	
		This measure should not be dropped entirely, but should at least be left in the contingency element.	These measures were dropped from the Bay Area Plan because they can be better planned at the state level. The contingency procedure does give us the option of adding them back in should the need arise.
		Re: Employer Programs	
		These programs should target more than 1% of employers.	It is hoped that funding can be obtained to enable RIDES and the Commute Alternatives Program to contact more employers than was claimed in the Plan. However, the emission reduction estimate was based on the most realistic estimate.

Date	From	Subject	Staff Response, Status & Recommendations
7/82	Ellen Fletcher, Santa Clara Valley Bicycle Association	Re: Bikes on Transit Need provision for carrying bikes on transit vehicles.	MTC is encouraging transit operators to at least experiment with this, and we will continue in these efforts.
		Re: Allocation of TDA Article 3 Funding Need better process for encouraging bikes at local level.	MTC, it its TDA Article 3 Guidelines, does suggest methods of developing greater public input.
		Re: Highways Building additional highways will not improve air quality.	It was suggested by several commentators that MTC should add highway construction--particularly "gap" closures--as a TCM. This was not done because the MTC agrees that the long-term effect of these facilities on air quality cannot be determined.
9/7/82	Ernestine DeFalco League of Women Voters	Re: MTC Capital Priorities Highways should have the same requirement as transit, i.e. they "enhance and support desired development patterns."	The RTP states: "Transportation plans shall be consistent with the Regional Plan as prepared by the Association of Bay Area Governments." Thus, highways do have this requirement.
		Re: Funding Sources MTC should give greater consideration to funding transit projects from those funding sources which can be used for either highways or transit.	MTC does attempt to fund transit to the maximum possible extent, and we do work with the counties to ensure that transit projects are considered under the joint funds.
9/7/82	Shelley Williams	Re: Traffic Flow Improvements Air pollution can be reduced by traffic flow improvement projects, such as completing freeway gaps, smoothing flow into arterials, and redesigning critical intersections.	Although these actions may improve traffic flow and hence reduce emissions in the short term, they could ultimately encourage more auto travel. The long-term effect of these strategies are uncertain.
9/7/82	Joe Beeson, Joe Beeson Enterprises	Re: Bicycle Measure Need to move to encourage bicycling, like setting aside freeway lanes at certain hours for bicycles, sponsoring classes on bicycle riding, and equipping transit vehicles to carry bicycles.	MTC will be promoting bicycle usage through the bicycle element of the RTP and the information manual for local governments.
9/7/82	Omar Chatty	Re: Highway Widening Most of the proposed transportation measures will not work; the solution is to widen highways in Santa Clara County.	See answer to Williams's comment.

SUMMARY OF COMMENTS RECEIVED ON THE DRAFT 1982 BAY AREA AIR QUALITY PLAN, AND STAFF RESPONSES

Date	From	Subject	Staff Review, Status and Recommendations
Aug. 17	Linda Best, COLAB	Re: compact growth and land use controls Recommends that any discussion of "compact growth" or any other land use controls (recommended or not) be deleted from this and any future Air Quality Plans because:	
		1) The projected reduction of 24 tons/day is unsubstantiated and probably over optimistic;	While no specific calculation or analysis was performed for this plan, the 24 tons/day estimate was cited from the analysis performed for the 1978 Environmental Management Plan to provide an order of magnitude estimate of the potential reduction that could be achieved if the compact growth policies were adopted across the region.
		2) The strategy is politically infeasible and not implementable by ABAG;	
		3) Compact growth alone cannot meet Bay Area housing needs, would increase the cost of housing and/or will force gentrification and increased pressure to develop in prime outlying agricultural areas;	
		4) Inclusion of land use controls in an air quality attainment plan (even if not recommended) could potentially expose the region to federal land use controls;	The mere mention of land use controls in an air quality attainment plan does not expose the region to federal land use controls.
		5) Land use controls were overwhelmingly rejected by all regional and local policy boards during hearings on the 1979 Environmental Management Plan.	
Aug. 26	Jeff Gabe, Citizens for a Better Environment	Re: land use measures Recommends adoption of the language on land use adopted by the ABAG Regional Planning Committee.	
		Re: inspection and maintenance Recommends that the effectiveness of I/M be realistically reviewed in light of recently approved legislation (SB33).	Staff have reviewed the provisions of SB33 and find the following: (a) it is unlikely that 41 tons/day hydrocarbon emissions reduction will be achieved by the I/M program authorized by SB33; (b) precise estimate of the emission reductions to be achieved depends upon many factors not specified in SB33; (c) based on EPA estimates, the I/M program authorized by SB33 could achieve the 25% or 29 tons/day hydrocarbon emission reduction requirement set by EPA. Based on these findings, the plan should recommend that the I/M program for the Bay Area be designed to satisfy (and if possible surpass) the EPA minimum requirement of 25% reduction for hydrocarbons and carbon monoxide. Additional stationary source control measures have been identified for future implementation depending upon the documented effectiveness of the I/M program that is eventually implemented.

SUMMARY OF COMMENTS RECEIVED ON THE DRAFT 1982 BAY AREA AIR QUALITY PLAN, AND STAFF RESPONSES (Cont'd.)

Date	From	Subject	Staff Review, Status and Recommendations
Aug. 26	Jeff Gabe, Citizens for a Better Environment (Cont'd.)	Re: emission reduction target for hydrocarbons Believes that the current 85 tons/day emission reduction target is an underestimate, and that a 100 tons/day target would be more in keeping with the Clean Air Act requirement to ensure attainment of air quality standards.	The 85 tons/day emission reduction target was derived from LIRAQ model tests. Conducted as objectively as possible and reviewed by a multi-agency committee of air quality modeling experts, these tests are believed to yield the best estimate of emission reductions needed to achieve the federal ozone standard.
		Re: mandatory Indirect Source Review Recommends that a mandatory Indirect Source Review permit system be adopted for traffic-inducing projects proposed in the Bay Area.	
		Re: transportation control measures Recommended that the proposed transportation controls should be expanded and made more effective.	
Aug. 26	Michael Seaman, California Air Resources Board	Re: inspection and maintenance The plan's assumptions about motor vehicle inspection and maintenance should be reconsidered after legislative authorization of a specific program.	See previous response to similar comment by Jeff Gabe, Citizens for a Better Environment.
		Re: development project review The provisions for advisory review of plans and projects and for conformity assessment of federally-supported activities are worthwhile measures that can help maintain federal air quality standards in the long term. We recommend that the district in cooperation with ABAG and MTC develop review and mitigation criteria for major development projects.	
		Re: role of local governments The plan should be more specific about what will be expected from the cities and counties in the region. There is extensive discussion, for example, of what two cities (Oakland and San Jose) will be doing. We feel that other cities and the counties should also participate in the plan's implementation. The land use measure (pp. C-1 to C-5) has been endorsed by the ABAG Regional Planning Committee. We support the Committee's approach because it would stimulate direct participation in the plan's strategies by local jurisdictions.	Oakland and San Jose are discussed in the plan because there are specific, measured CO problems in these cities. As CO hot spots become verified through monitoring, additional jurisdictions will be encouraged to participate in implementation of measures specific to the area in violation.
		Re: on-going planning Given the uncertainty associated with the plan's assumptions, the need to monitor the implementation is well understood. There have been discussions that the plan will be updated in 1985,	Future activities will be limited by available funding. The co-lead agencies are committed to continuation of the planning process, but the level of effort is highly contingent on the resources available at any given time.

SAMMARY OF COMMENTS RECEIVED ON THE DRAFT 1982 BAY AREA AIR QUALITY PLAN, AND STAFF RESPONSES (Cont'd.)

Date	From	Subject	Staff Review, Status and Recommendations
Aug. 26	Michael Seaman, California Air Resources Board (Cont'd.)	Re: on-going planning (cont'd.) and the draft plan calls for an annual review (pp. 153-154). However, the discussion of annual reports is unclear as to the implementation of the program. The final plan should clarify the schedule for plan review; it should identify the means and define responsibilities for so doing.	
		Re: transportation measures We have a number of concerns about the plans's transportation measures. These have been communicated to MTC.	Referred to MTC.
Aug. 26	Gary W. Hambly, Building Industry Association of Northern California	Re: land use controls Requests that the ABAG Executive Board eliminate reference to land use and transportation controls from the plan because: 1) Scientific evidence and logical analysis indicate that land use controls could have little if any impact on air quality by 1987. 2) Analysis of recent development trends makes highly suspect the projected 24 tons/day of hydrocarbon emission savings that the report claims could be achieved by 2000. 3) A regional "compact growth" strategy would inhibit and likely prohibit the Bay Area from meeting its current regional housing need. 4) Land use controls were overwhelmingly rejected by the ABAG General Assembly and all regional and local policy boards after the hearings on the 1979 Environmental Management Plan.	See previous response to similar comment by Linda Best, COLAB.
Aug. 26	Fred Scullin, private citizen, Alameda, California	Re: proposed solid waste-fired electric generating station of the City of Alameda The plan does not take account of the proposed solid-waste-fired electric generating station planned by the City of Alameda. This facility will emit large quantities of carbon monoxide (2,857 lbs/day-4,482 lbs/day). Why are there no proposed carbon monoxide control measures for stationary sources?	As documented in Air Quality Technical Memorandum 38, "Resource Recovery and Cogeneration Projects in the 1982 Plan," this facility is accounted for in the baseline emission inventory projections for 1987, and is therefore accommodated in the plan. Despite the seemingly large quantity of CO emissions from such facilities, motor vehicles make a far greater contribution (about 90%) to CO problems than relatively isolated point sources. Further, there are no significant stationary sources of CO in the vicinity of the CO hot spot problem areas identified to date. Therefore, no stationary source CO control measures have been proposed.

SUMMARY OF COMMENTS RECEIVED ON THE DRAFT 1982 BAY AREA AIR QUALITY PLAN, AND STAFF RESPONSES (Cont'd.)

Date	From	Subject	Staff Review, Status and Recommendations
Aug. 26	William R. Trulock, Alcoal Fuels, Tiburon, California	Re: alcohol fuels for motor vehicles The solution to the problem is to change the fuel used in motor vehicles to clean burning alternatives such as alcohol and hydrogen.	The California Air Resources Board continually reviews fuel modifications as a means of controlling vehicle emissions. The 1979 Plan currently contains a recommendation to the ARB to adopt more stringent (50% reduction from current levels) exhaust emission standards for motor vehicles beginning in 1990. Such a change in the standard could serve to encourage the development and marketing of cleaner fuel/engine combinations in the future.
Aug. 26	Adelia Sabiston, League of Women Voters of the Bay Area	Re: inspection and maintenance The biennial I/M program passed by the legislature will account for less emission reduction than proposed in the plan. The difference should be found elsewhere.	See previous response to similar comment by Jeff Gabe, Citizens for a Better Environment.
		Re: transportation measures The importance of transportation measures in reducing emissions has been underestimated, and funding for those measures proposed is uncertain. Therefore, additional measures should be sought.	This comment has been referred to MTC.
		Re: Indirect Source Review and land use measures Indirect Source Review should be mandatory, not advisory, and should apply to all jurisdictions. Land use measures are also needed to maintain clean air and should also be included in the plan.	

APPENDIX K

CALIFORNIA AIR RESOURCES BOARD

NEW VEHICLE STANDARDS SUMMARY

CALIFORNIA AIR RESOURCES BOARD

NEW VEHICLE STANDARDS SUMMARY

PASSENGER CARS - EXHAUST EMISSIONS STANDARDS

The following California standards, up through 1979, and federal standards, up through 1974, apply only to gasoline-powered passenger cars(1). Federal standards for 1975 and later and California standards for 1980 and later, apply to both gasoline and diesel-powered passenger cars.

YEAR	STANDARD	TEST PROCEDURE	HYDRO-CARBONS(HC)	CARBON MONOXIDE(CO)	OXIDES OF NITROGEN(NOx)
Prior to controls	none	7-mode 7-mode CVS-75	850 ppm 11 g/mi 8.8 g/mi	3.4% 80 g/mi 87.0 g/mi	1000 ppm 4 g/mi 3.6 g/mi
		50,000 MILE EXHAUST EMISSIONS STANDARDS			
1966-67	Calif.	7-mode	275 ppm	1.5%	no std.
1968-69	Calif. federal	7-mode 50-100 CID 101-140 CID over-140 CID	 410 ppm 350 ppm 275 ppm	 2.3% 2.0% 1.5%	 no std. no std. no std.
				(GRAMS PER MILE)	
1970	Calif. federal	7-mode	2.2	23	no std.
1971	Calif. federal	7-mode 7-mode	2.2 2.2	23 23	4.0 no std.
1972	Calif. Calif. federal	7 mode or CVS-72 "	1.5 3.2 3.4	23 39 39	3.0 3.2 (2) no std.
1973	Calif. federal	CVS-72 "	3.2 3.4	39 39	3.0 3.0
1974	Calif. federal	" "	3.2 3.4	39 39	2.0 3.0
1975-76	Calif. federal	CVS-75 "	0.9 (3) 1.5	9.0 15	2.0 3.1
1977-79	Calif. federal	" "	0.41 1.5	9.0 15	1.5 2.0

(Revised 1/12/82)

PASSENGER CARS

50,000 MILE EXHAUST EMISSIONS STANDARDS
CVS-75 Test Procedure

(GRAMS PER MILE)

YEAR	STANDARD	HYDROCARBONS(4)		CARBON MONOXIDE CO	OXIDES OF NITROGEN NOx
		Non-Methane	Total HC		
1980	Calif.	0.39	(0.41)	9.0	1.0(8)
	federal	no std.	(0.41)	7.0	2.0
1981	Calif. (5) Option A	no std.	(0.41)	3.4	1.0(8)
	" (5) Option B	0.39	(0.41)	7.0	0.7(8)
	federal	no std.	(0.41)	3.4	1.0
1982	Calif. (5) Option A	0.39	(0.41)	7.0	0.4(9)
	" (5) Option B	0.39	(0.41)	7.0	0.7(9)
	federal	no std.	(0.41)	3.4	1.0
1983 & Subsequent	Calif.	0.39	(0.41)	7.0	0.4(10)
	"	0.39	(0.41)	7.0	0.7(11)
	federal	no std.	(0.41)	3.4	1.0

CALIFORNIA 100,000 MILE EXHAUST EMISSIONS STANDARDS
CVS-75 Test Procedure
(GRAMS PER MILE)

1980	(6)(7) Option 1	0.39	(0.41)	9.0	1.5
	(6)(7) Option 2	0.46	no std.	10.6	1.5
1981	(6)(7) Option 1	0.39	no std.	3.4	1.5
	(6)(7) Option 2	0.46	no std.	4.0	1.5
1982-83	(6) Option 1	0.39	(0.41)	7.0	1.5
	(6) Option 2	0.46	no std.	8.3	1.5
1984 & Subsequent	(6) Option 1	0.39	(0.41)	7.0	1.0
	(6) Option 2	0.46	no std.	8.3	1.0

(1) Passenger car as defined in Title 13 of the California Administrative Code means any motor vehicle designed primarily for transportation of persons having a capacity of twelve persons or less.

(2) Hot 7-mode test.

(3) Hydrocarbon emissions from 1975-76 limited production vehicles may not exceed 1.5 gm/mi.

(4) Hydrocarbon standards in parentheses indicate total hydrocarbons. When applicable, manufacturers may elect to certify vehicle to either the nonmethane or total hydrocarbon standards.

PASSENGER CARS

(5) For the 1981 model year, manufacturers may choose either options A or B for their entire 50,000 mile certified product line. The option chosen in 1981 must be retained for the 1982 model year.

(6) 100,000 mile options: Option 1 standards refer to the projected 50,000 mile emissions for hydrocarbons and carbon monoxide while Option 2 standards refer to the projected 100,000 mile emissions for these pollutants. NOx emission standards for both options refer to the 100,000 mile projected emissions.

(7) For vehicles with evaporative emissions values below 1.0 g/test, an adjustment to the exhaust hydrocarbon emissions standard may be granted by the Executive Officer (100,000 mile option only).

(8) 1.5 g/mi NOx standard for small manufacturers subject to "in lieu" standards pursuant to Section 1960.2 of Title 13, California Administrative Code. Production passenger cars must meet a 1.0 g/mi cumulative corporate average NOx standard based upon a full year's production.

(9) 1.0 g/mi NOx standard for small manufacturers subject to "in lieu" standards pursuant to Section 1960.4 of Title 13, California Administrative Code. Production passenger cars must meet a 0.7 g/mi cumulative corporate average NOx standard for the full 1982 model year production.

(10) 0.7 g/mi NOx standard for the 1983 and 1984 model years for small manufacturers subject to "in lieu" standards pursuant to Section 1960.4 of Title 13, California Administrative Code. Production passenger cars must meet a 0.7 g/mi cumulative corporate average NOx standard for each production quarter. For 1985 and subsequent model years a small manufacturer must meet a 0.4 g/mi NOx standard for the prototype vehicle certification and for production vehicles per engine family on a quarterly basis.

(11) A manufacturer may choose to certify to this optional set of standards provided that the conditions set forth in Section 1960.15, Title 13, California Administrative Code are met. These conditions include a 7 year/75,000 mile recall provision for selected emission control parts.

Additional Requirements

Beginning with the 1980 model-year, the maximum projected emissions of oxides of nitrogen measured on the federal Highway Fuel Economy Test shall be no greater than 1.33 times the applicable passenger car oxides of nitrogen standards shown above.

Effective 1978, evaporative emission standards are 6.0 grams per SHED test for the 1978-79 model years and 2.0 grams per SHED test for 1980 and later model years.

SHED Test (Sealed Housing Evaporative Determination) - A method for measuring evaporative emissions from motor vehicles.

Previous evaporative emission standards of 6.0 grams per test for 1970-71 and 2.0 grams per test for 1972 and later were based on the "carbon trap procedure" which became obsolete when the SHED test procedure was adopted for 1978 and subsequent model years.

Beginning with the 1982 model year diesel-powered passenger cars must meet a 0.6 g/mi particulate standard. Commencing with the 1985 and subsequent model years the particulate standard is 0.2 g/mi.

g/mi	-	grams per mile.
CVS-72	-	constant volume sample cold start test.
CVS-75	-	constant volume sample test which includes cold and hot starts.
7-mode	-	137 second driving cycle test.
ppm	-	parts per million.

NEW VEHICLE STANDARDS SUMMARY

LIGHT-DUTY TRUCKS - EXHAUST EMISSION STANDARDS

The following California standards, up through 1977, and federal standards, up through 1975, apply only to gasoline-powered light-duty trucks(1). Federal standards for 1975 and later and California standards for 1978 and later apply to both gasoline and diesel-powered light-duty trucks.

50,000 MILE EXHAUST EMISSIONS STANDARDS

YEAR	STANDARD	TEST PROCEDURE	HYDRO-CARBONS(HC)	CARBON MONOXIDE(CO)	OXIDES OF NITROGEN(NOx)
1966-67	Calif.	7-mode	275 ppm	1.5%	no std.
1968-69	Calif. federal	7-mode			
		50-100 CID	410 ppm	2.3%	no std.
		101-140 CID	350 ppm	2.0%	no std.
		over-140 CID	275 ppm	1.5%	no std.
				(GRAMS PER MILE)	
1970	Calif. federal	7-mode	2.2	23	no std.
1971	Calif.	7-mode	2.2	23	4.0
	federal	7-mode	2.2	23	no std.
1972	Calif.	7 mode or	1.5	23	3.0
	Calif.	CVS-72	3.2	39	3.2 (2)
	federal	"	3.4	39	no std.
1973	Calif.	CVS-72	3.2	39	3.0
	federal	"	3.4	39	3.0
1974	Calif.	"	3.2	39	2.0
	federal	"	3.4	39	3.0
1975	Calif.	CVS-75	2.0	20	2.0
	federal	"	2.0	20	3.1
1976-78	Calif.	"	0.9	17	2.0
	federal	"	2.0	20	3.1
1979	Calif.(3)	"	0.41	9.0	1.5(6)
	" (4)	"	0.50	9.0	2.0
	federal(5)	"	1.7	18	2.3

LIGHT-DUTY TRUCKS

50,000 MILE EXHAUST EMISSIONS STANDARDS
CVS-75 Test Procedure

(GRAMS PER MILE)

YEAR	STANDARD	HYDROCARBONS(8) Non-Methane	HYDROCARBONS(8) Total HC	CARBON MONOXIDE CO	OXIDES OF NITROGEN NOx
1980	Calif.(3)	0.39	(0.41)	9.0	1.5(6)
	" (4)	0.50	(0.50)	9.0	2.0
	federal	no std.	(1.7)	18.0	2.3
1981-82	Calif.(3)	0.39	(0.41)	9.0	1.0(7)
	" (4)	0.50	(0.50)	9.0	1.5
	federal	no std.	(1.7)	18.0	2.3
1983 & Subsequent	Calif.(3)	0.39	(0.41)	9.0	0.4(11)
	" (3)	0.39	(0.41)	9.0	1.0(12)
	" (4)	0.50	(0.50)	9.0	1.0
	federal	no std.	(1.7)	18.0	2.3

CALIFORNIA 100,000 MILE EXHAUST EMISSIONS STANDARDS
CVS-75 Test Procedure
(GRAMS PER MILE)

YEAR	STANDARD	Non-Methane	Total HC	CO	NOx
1981-83	(3) Option 1(9)(10)	0.39	(0.41)	9.0	1.5
	(3) Option 2(9)(10)	0.46	no std.	10.6	1.5
	(4) (10)	0.50	(0.50)	9.0	2.0
1984 & Subsequent	(3) Option 1(9)	0.39	(0.41)	9.0	1.0
	(3) Option 2(9)	0.46	no std.	10.6	1.0
	(4)	0.50	(0.50)	9.0	1.5

(1) Light-duty trucks as defined by Title 13 of the California Administrative Code means any motor vehicle rated at 6,000 lbs. GVW or less which is designed primarily for purposes of transportation of property or is a derivative of such vehicle, or is available with special feature enabling off-street or off-highway operation and use.

(2) Hot 7-mode test.

(3) 0-3999 pounds equivalent inertia weight (curb weight plus 300 pounds).

(4) 4000-5999 pounds equivalent inertia weight.

LIGHT-DUTY TRUCKS

(5) Effective 1979, federal LDT classification will be extended to 8500 pounds GVW.

(6) 2.0 g/mi NOx for four-wheel drive vehicles in this category.

(7) 1.5 g/mi NOx for small manufacturers subject to "in lieu" standards pursuant to Section 1960.3 of Title 13, California Administrative Code. Production light-duty trucks must meet a 1.0 g/mi cumulative corporate average NOx standard based upon a full year's production.

(8) Hydrocarbon standards in parentheses indicate total hydrocarbon. When applicable, manufacturers may elect to certify vehicles to either the non-methane or total hydrocarbon standards.

(9) 100,000 mile options: Option 1 standards refer to the projected 50,000 mile emissions for hydrocarbons and carbon monoxide while Option 2 standards refer to the projected 100,000 mile emissions for these pollutants. NOx emission standards for both options refer to the 100,000 mile projected emissions.

(10) For 1981 model year vehicles with evaporative emissions values below 1.0 g/test, an adjustment to the exhaust hydrocarbon emissions standard may be granted by the Executive Officer (100,000 mile option only).

(11) 1.0 g/mi NOx standard for small manufacturers subject to "in lieu" standards pursuant to Section 1960.4 of Title 13, California Administrative Code. Production light-duty trucks must meet a 0.7 g/mi cumulative corporate average NOx standard for the full model year's production.

0.7 g/mi NOx standard for small manufacturers for the 1984 and 1985 model years. Production light-duty trucks must meet a 0.7 g/mi cumulative corporate average NOx standard for each production quarter.

For the 1986 and subsequent model years a small manufacturer must meet a 0.4 g/mi NOx standard for the prototype vehicle certification and for production vehicles per engine family on a quarterly basis.

(12) A manufacturer may choose to certify to this optional set of standards provided that the conditions set forth in Section 1960.15, Title 13, California Administrative Code are met. These conditions include a 7 year/75,000 mile recall provision for selected emission control parts.

g/mi - grams per mile.
CVS-72 - constant volume sample cold start test.
CVS-75 - constant volume sample which includes cold and hot starts.
7-mode - 137 second driving cycle test.
ppm - parts per million

LIGHT-DUTY TRUCKS

Additional Requirements

Beginning with the 1981 model year, the maximum projected emissions of oxides of nitrogen measured on the federal Highway Fuel Economy Test shall be no greater than 2.0 times the applicable light-duty truck oxides of nitrogen standards shown above.

Effective 1978, evaporative emission standards are 6.0 grams per SHED test for 1978-79 model year and 2.0 grams per SHED test for 1980 and later model year.

SHED Test (Sealed Housing Evaporative Determination) - A method for measuring evaporative emissions from motor vehicles.

Previous evaporative emission standards of 6.0 grams per test for 1970-71 and 2.0 grams per test for 1972 and later were based on the "carbon trap procedure" which became obsolete when the SHED test procedure was adopted for 1978 and subsequent model years.

Beginning with the 1982 model year diesel-powered light-duty trucks must meet a 0.6 g/mi particulate standard. Commencing with the 1985 and subsequent model years the particulate standard is 0.26 g/mi.

NEW VEHICLE STANDARDS SUMMARY

MEDIUM-DUTY VEHICLES - EXHAUST EMISSIONS STANDARDS

The following California standards, up through 1972, and federal standards, up through 1973, apply only to gasoline-powered medium-duty vehicles(1). California standards for 1973 and later year and federal standards for 1974 and later apply to both gasoline and diesel-powered medium-duty vehicles.

YEAR	STANDARD	HYDROCARBONS(5) Non-Methane	HYDROCARBONS(5) Total HC	CARBON MONOXIDE CO	OXIDES OF NITROGEN NOx
1969-77	Calif.	SEE HEAVY-DUTY STANDARDS			
1970-78	federal	SEE HEAVY-DUTY STANDARDS			
		50,000 MILE EXHAUST EMISSIONS STANDARDS CVS-75 Test Procedure (GRAMS PER MILE)			
1978-79	Calif.	no std.	(0.9)	17	2.3
1979	federal	see light-duty truck standards			
1980	Calif.	0.9	(0.9)	17	2.3
	federal	no std.	(1.7)	18	2.3
1981-82	Calif. (2)	0.39	(0.41)	9.0	1.0(8)
	" (3)	0.50	(0.50)	9.0	1.5
	" (4)	0.60	(0.60)	9.0	2.0
	federal	no std.	(1.7)	18.0	2.3
1983 & Subsequent	Calif. (2)	0.39	(0.41)	9.0	0.4(9)
	" (2)	0.39	(0.41)	9.0	1.0(10)
	" (3)	0.50	(0.50)	9.0	1.0
	" (4)	0.60	(0.60)	9.0	1.5
	federal	no std.	(1.7)	18.0	2.3

MEDIUM-DUTY VEHICLES

CALIFORNIA 100,000 MILE EXHAUST EMISSIONS STANDARDS
CVS-75 Test Procedure

YEAR	STANDARD	HYDROCARBONS(5) Non-Methane	Total HC	CARBON MONOXIDE CO	OXIDES OF NITROGEN NOx
1981	(2)Option 1(6)(7)	0.39	(0.41)	9.0	1.5
	(2)Option 2(6)(7)	0.46	no std.	10.6	1.5
	(3)	0.50	(0.50)	9.0	2.0
	(4)	0.60	(0.60)	9.0	2.3
1983	(2)Option 1(6)	0.39	(0.41)	9.0	1.5
	(2)Option 2(6)	0.46	no std.	10.6	1.5
	(3)	0.50	(0.50)	9.0	2.0
	(4)	0.60	(0.60)	9.0	2.0
1984 & Subsequent	(2)Option 1(6)	0.39	(0.41)	9.0	1.0
	(2)Option 2(6)	0.46	no std.	10.6	1.0
	(3)	0.50	(0.50)	9.0	1.5
	(4)	0.60	(0.60)	9.0	2.0

(1) Medium-duty vehicles as defined in Title 13 of the California Administrative Code means any heavy-duty vehicles having a manufacturer's gross vehicle weight rating of 8,500 pounds or less (Manufacturers may elect to certify medium-duty vehicles up to 10,000 pounds (GVW)).

(2) 0-3999 pounds equivalent inertia weight (curb weight plus 300 pounds).

(3) 4000-5999 pounds equivalent inertia weight.

(4) 6000-8500 (or 10,000) pounds equivalent inertia weight.

(5) Hydrocarbon standards in parentheses indicate total hydrocarbon. When applicable, manufacturers may elect to certify vehicles to either the non-methane or total hydrocarbon standards.

(6) 100,000 mile options: Option 1 standards refer to the projected 50,000 mile emissions for hydrocarbons and carbon monoxide while Option 2 standards refer to the projected 100,000 mile emissions for these pollutants. NOx emission standards for both options refer to the 100,000 mile projected emissions.

(7) For 1981 model year vehicles with evaporative emissions values below 1.0 g/test, an adjustment to the exhaust hydrocarbon emissions standard may be granted by the Executive Officer (100,000 mile option only).

MEDIUM-DUTY VEHICLES

(8) 1.5 g/mi NOx for small manufacturers subject to "in lieu" standards pursuant to Section 1960.3 of Title 13, California Administrative Code. Production medium-duty vehicles must meet a 1.0 g/mi cumulative corporate average NOx standard based upon a full year's production.

(9) 1.0 g/mi NOx standard for small manufacturers subject to "in lieu" standards pursuant to Section 1960.4 of Title 13, California Administrative Code. Production medium-duty vehicles must meet a 0.7 g/mi cumulative corporate average NOx standard for the full model year's production.

0.7 g/mi NOx standard for small manufacturers for the 1984 and 1985 model years. Production medium-duty vehicles must meet a 0.7 g/mi cumulative corporate average NOx standard for each production quarter.

For the 1986 and subsequent model years a small manufacturer must meet a 0.4 g/mi NOx standard for the prototype vehicle certification and for production vehicles per engine family on a quarterly basis.

(10) A manufacturer may choose to certify to this optional set of standards provided that the conditions set forth in Section 1960.15, Title 13, California Administrative Code are met. These conditions include a 7 year/75,000 mile recall provision for selected emission control parts.

g/mi - grams per mile
CVS-75 - constant volume sample test which includes cold and hot starts.

Additional Requirements

Beginning with the 1981 model year, the maximum projected emissions of oxides of nitrogen measured on the federal Highway Fuel Economy Test shall be no greater than 2.0 times the applicable medium-duty vehicle oxides of nitrogen standards shown above.

Effective 1978, evaporative emission standards are 6.0 grams per SHED test for the 1978-79 model years and 2.0 grams per SHED for 1980 and later model years.

SHED Test (Sealed Housing Evaporative Determination) - A method for measuring evaporative emissions from motor vehicles.

Previous evaporative emission standards of 6.0 grams per test for 1970-71 and 2.0 grams per test for 1972 and later were based on the "carbon trap procedure" which became obsolete when the SHED test procedure was adopted for 1978 and subsequent model years.

Beginning with the 1982 model year, diesel-powered medium-duty vehicles must meet a 0.6 g/mi particulate standard. Commencing with the 1985 and subsequent model years, the particulate standard is 0.26 g/mi.

NEW VEHICLE STANDARDS SUMMARY

HEAVY-DUTY ENGINES AND VEHICLES - EXHAUST EMISSION STANDARDS (DIESEL (1) AND GASOLINE)

The following is a summary of heavy-duty engine and vehicle (2) standards adopted by both the California Air Resources Board and federal Environmental Protection Agency, based on the 9-mode test procedures for gasoline engines and 13-mode test procedures for diesel engines. Also see footnote (5).

YEAR	STANDARD	HYDRO-CARBONS	CARBON MONOXIDE	OXIDES OF NITROGEN	HYDROCARBONS & OXIDES OF NITROGEN
1969-71 (3)	Calif.	275 ppm	1.5%	no std.	no std.
1970-73 (4)	federal	275 ppm	1.5%	no std.	no std.
1972	Calif.	180 ppm	1.0%	no std.	no std.
		(GRAMS PER BRAKE-HORSEPOWER-HOUR)			
1973-74	Calif.	no std.	40	no std.	16
1973-78	federal	no std.	40	no std.	16
1975-76	Calif.	no std.	30	no std.	10
1977-78	Calif. or	no std.	25	no std.	5
	Calif.	1.0	25	7.5	no std.
1979 (6)	Calif. or	1.5	25	7.5	no std.
	Calif. or	no std.	25	no std.	5
	Calif.	1.0	25	7.5	no std.
1979-1983	federal or	1.5	25	no std.	10
	federal	no std.	25	no std.	5
1980-83	Calif. or	1.0	25	no std.	6.0
	Calif.	no std.	25	no std.	5
1984 & later	Calif. or	0.5	25	no std.	4.5
	Calif. (5)	1.3	15.5	5.1	no std.
	federal (5)	1.3	15.5	10.7	no std.

(1) The above standards apply to diesel engines and vehicles sold in California on or after January 1, 1973 and nationwide on or after January 1, 1974.

(2) These standards apply to motor vehicles having a manufacturer's GVW rating of over 6000 pounds, excluding passenger cars and 1978 and later medium-duty vehicles.

(3) Applies to vehicles manufactured on or after January 1, 1969.

(4) Applies to vehicles manufactured on or after January 1, 1970.

(5) These standards are based upon the new transient cycle test procedures.

(6) For 1979 only, manufacturer using heated flame ionization detection (HFID) method of measuring hydrocarbons must meet the 1.5 g/bhp-hr standard; whereas manufacturers using non-dispersive infrared (NDIR) method of measuring hydrocarbons must meet the 1.0 g/bhp-hr standard. Both standards are equivalent in stringency. Manufacturers may use either HFID or NDIR in meeting the combined hydrocarbon and oxides of nitrogen standard of 5 g/bhp-hr. After 1979, manufacturers are required to use HFID.

g/bhp-hr - grams per brake-horsepower-hour
ppm - parts per million.

Additional Requirements

Effective 1978, evaporative emission standards are 6.0 grams per SHED test for the 1978-79 model years and 2.0 grams per SHED test for 1980 and later model years.

SHED Test (Sealed Housing Evaporative Determination) A method for measuring evaporative emissions from motor vehicles.

Previous evaporative emission standards of 6.0 grams per test for 1970-1971 and 2.0 grams per test for 1972 and later were based on the "carbon trap procedure" which became obsolete when the SHED test procedure was adopted for 1978 and subsequent model years.

NEW VEHICLE STANDARDS SUMMARY

MOTORCYCLES

The following is a summary of motorcycle (1) standards adopted by both the California Air Resources Board and the federal Environmental Protection Agency.

YEAR	STANDARD	DISPLACEMENT(2)(4)	HYDROCARBONS	CARBON MONOXIDE
1978-79	Calif. & federal	50-169	5.0 g/km	17 g/km
		170-749	5.0 + 0.0155 (D-170) g/km (3)	17 g/km
		750 or greater	14 g/km	17 g/km
1980-81	Calif.	All (50 or greater)	5.0 g/km	12 g/km
1980 & later	federal	All (50 or greater)	5.0 g/km	12 g/km
1982 & later	Calif.	50-279	1.0 g/km (5)	12 g/km
1982 and 1983		280 or greater	2.5 g/km	12 g/km
1984 and later		280 or greater	1.0 g/km	12 g/km

(1) Any motor vehicle other than a tractor having a seat or saddle for the use of the rider and designed to travel on not more than three wheels in contact with the ground and weighing less than 1500 pounds, except that four wheels may be in contact with the ground when two of the wheels function as a sidecar.

(2) Displacement shown in cubic centimeters.

(3) Motorcycle Hydrocarbon Formula

D = engine displacement in cubic centimeters
e.g., 300 cc engine; standard = (300-17) X .0155 + 5.0 = 7.0 g/km

(4) Federal classifications based on engine displacement are:

Class	Displacement (cc)
I	50-169
II	170-279
III	280-greater

(5) Small volume manufacturers (under 3,000 new units sold per year in California) can apply for a standard of up to 5.0 grams per kilometer hydrocarbon exhaust for 1982 model year Class I and II motorcycles only.

g/km = grams per kilometer

MOTORCYCLES

Additional Requirements

Effective 1983, evaporative emission standards for Classes I and II are 6.0 grams per SHED test for 1983-84 model years, and 2.0 grams per SHED test for 1985 and later model years.

Effective 1984, evaporative emission standards for Class III are 6.0 grams per SHED test for 1984-85 model years, and 2.0 grams per SHED test for 1986 and later model years.

SHED Test (Sealed Housing Evaporative Determination) - A method for measuring evaporative emissions from motorcycles.